CHAPTER 1 ESTABLISHING EFFLUENT LIMITATIONS FOR PRIORITY POLLUTANT CRITERIA/OBJECTIVES

This chapter will briefly describe and compare the alternatives identified by the SWRCB for establishing water quality-based effluent limitations for the chemical-specific priority pollutant criteria contained in the CTR or the water quality objectives for priority pollutants contained in basin plans. The sub-chapters are organized according to the procedures a permit writer would follow when establishing water quality-based effluent limitations for pollutant sources that enter the water bodies to which these criteria/objectives apply.

Pollutants may enter a water body from either point sources or nonpoint sources. Point source discharges have a definable point of discharge, such as a pipe, whereas pollutants from nonpoint sources enter the water body in a diffuse manner. These two sources of pollutants are generally regulated differently.

Point source discharges to navigable surface waters of the U.S. are regulated under Federal National Pollutant Discharge Elimination System (NPDES) permits. The NPDES program was established by the CWA, and is implemented in California by the SWRCB and the RWQCBs, under an approved program. The CWA requires that NPDES permits include technology-based and, where appropriate, water quality-based effluent limitations.

The NPDES permits are primarily aimed at controlling point source discharges to navigable surface waters of the U.S. Discharges to waste water treatment systems, such as percolation ponds, generally do not need a NPDES permit. Similarly, point source discharges of agricultural drainage waters do not need a NPDES permit, even if they discharge to waters of the U.S. Some nonpoint source discharges to non-attainment waters may be regulated under other provisions of the CWA.

Under the Porter-Cologne Water Quality Control Act the term waste discharge requirements (WDRs) includes both waste discharge requirements regulating nonpoint sources and NPDES permits for point source discharges. NPDES permits in California are therefore also WDRs, and must comply with the Porter-Cologne Water Quality Control Act to the extent that these provisions are consistent with the CWA.

Discharges that are not subject to regulation under an NPDES permit are regulated under non-NPDES WDRs. Any person discharging waste or proposing to discharge waste that could affect the quality of waters of the State, other than into a community sewer system, must file a report of waste discharge with the RWQCB, which may then prescribe WDRs.

The Federal Clean Water Act (CWA) (CWA Sections 301 and 402, in particular) and the Porter-Cologne Water Quality Control Act, as well as Federal and State regulations implementing these laws, provide the overall authority for regulating discharges by establishing effluent limitations in WDRs. Effluent limitations are restrictions imposed on the concentrations, discharge rates, and mass quantities of discharged pollutants. Effluent limitations may be either technology-based or water quality-based.

Technology-based effluent limitations, for the purposes of the CWA, are national performance standards set by the U.S. EPA, for point source dischargers that define achievable treatment levels for a particular pollutant or class of pollutant (CWA Section 301; 40 CFR 125, 133, 401-471). Technology-based effluent limitations must be met at the end-of-pipe (i.e., prior to the discharge entering the receiving water). If technology-based effluent limitations are not stringent enough to ensure that applicable water quality criteria or statewide water quality objectives for priority pollutants are met, water quality-based effluent limitations are required (CWA Section 302; 40 CFR 122). Additionally, water quality-based effluent limitations are developed to meet narrative or numeric chemical-specific and toxicity criteria.

Water quality-based effluent limitations are established primarily to ensure that the water quality is attained or maintained at a level that protects aquatic life, human health, and other beneficial uses against adverse impacts. Beneficial uses of water, which are water quality dependent, include municipal and domestic supply, agricultural supply, industrial supply, aquatic habitats, recreation including fishing, ground water recharge, etc.

The following sub-chapters will describe alternative methods for establishing water quality-based effluent limitations for applicable priority pollutant criteria/objectives for inclusion in WDRs. The numeric criteria in the CTR, which the proposed Policy will implement, have been developed to protect aquatic life and human health. The CTR aquatic life criteria have been developed for both fresh and salt water. They are specified as 1-hour average concentrations to protect against acute adverse impacts, and as 4-day average concentrations to protect against chronic adverse impacts. The CTR human health criteria are set as 30-day average concentrations which account for consumption of water, fish, and shellfish.

For both NPDES permits and other WDRs, the permit writer must first determine if it is necessary to control a pollutant in a discharge by establishing effluent limitations (discussed in Chapter 1.1). If effluent limitations are necessary for the pollutant, the permit writer then must calculate these limitations (discussed in Chapter 1.2). Subheadings under Chapter 1.2 include issues that must be considered when calculating effluent limitations, such as metals translators, mixing zones, background levels, intake water credit, and interim limitations. Each section includes the present State policy, a description of the issue, the various alternatives, and the alternative recommended by SWRCB staff.

CHAPTER 1.1 SELECTION OF POLLUTANTS ("REASONABLE POTENTIAL")

I. PRESENT STATE POLICY

Currently, no statewide law, regulation, plan, or policy specifies procedures for determining when effluent limitations are necessary to control discharged pollutants and prevent adverse impacts to receiving waters. Permit writers at most RWQCBs presently use their best professional judgement[1] and guidance found in various technical documents when identifying the pollutants in a discharge requiring water quality-based effluent limitations. Only the basin plan of the San Francisco Bay RWQCB includes specific procedures for determining when water quality-based effluent limitations should be established for substances in a discharge.

The San Francisco Bay Basin Plan requires water quality-based effluent limitations to be developed for all pollutants of concern unless dischargers certify that the pollutant is not present in the discharge and no change has occurred that may cause release of pollutants. This certification must be accompanied by monitoring results, and process and treatment descriptions, before issuance and reissuance of WDRs. The basin plan further states that dischargers must demonstrate to the satisfaction of the San Francisco Bay RWQCB that particular substances do not cause, or have the reasonable potential to cause, or contribute to an excursion (defined in Appendix B) above numerical or narrative objectives (i.e., exhibit "reasonable potential"). Low volume discharges may be exempted from certification and monitoring if the discharges have been determined to have no significant adverse impact on water quality.

II. ISSUE DESCRIPTION

"Reasonable potential" determinations are intended as a screening tool to identify pollutants in the effluent that may adversely affect ambient water quality. Effluent limitations can then be developed to control these pollutants. Once effluent limitations have been established for a pollutant, monitoring must be performed regularly by the discharger to assess compliance with the effluent limitations (see Chapter 2 for discussion on compliance determination and monitoring and reporting requirements). The monitoring results must be submitted to the RWQCB for evaluation with a frequency dependent on the nature and effect of the discharge, but at least annually (see 40 CFR 122.44). If no effluent limitation has been established for a priority pollutant in a discharge, the pollutant need only be monitored periodically (at least

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[1] Best professional judgement means the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data and information that forms the basis for the terms and conditions of an NPDES permit (U.S. EPA 1993). Best professional judgement, as used in this context, should be distinguished from the use of best professional judgement to develop technology-based effluent limitations in cases where an applicable effluent guideline has not been promulgated for an industry (see 40 CFR 125.3).

once prior to the issuance and reissuance of the permit) in the effluent to reassess "reasonable potential" and monitor effluent changes. The frequency of monitoring and reporting is determined by the RWQCBs.

Under State law, the RWQCBs are required to prescribe WDRs that implement the relevant water quality control plan, including any applicable water quality objectives (Water Code §13263). State law does not provide any further guidance on the selection of pollutants to be regulated under WDRs.

Federal NPDES regulations for NPDES permits (40 CFR 122.44 (d)(1)) require that water-quality based effluent limitations be established for any pollutants discharged "at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard." If a numeric criterion/objective exists for a pollutant, the permitting authority must determine whether that pollutant is present in the discharge at a level that has "reasonable potential".

When determining if "reasonable potential" exists, all relevant available data and the following elements must be considered: (1) existing controls on point and nonpoint source pollution, (2) variability of the pollutant or pollutant parameter in the effluent, and (3) dilution of the effluent in the receiving water (where appropriate) (40 CFR 122.44 (d)(1)).

Because the Federal regulation on "reasonable potential" is written broadly, it is open to a range of interpretations. The U.S. EPA has, however, published procedural guidance on determining "reasonable potential" in the Technical Support Document for Water Quality-Based Toxics Control (TSD) (U.S. EPA 1991). This guidance recommends a sequential process. Pollutants of concern are first identified based on available data, then the applicable water quality criteria or objectives for these pollutants are determined. For each pollutant, a critical effluent concentration is calculated based on statistical analysis of historical effluent data (if a dynamic model is used, this step may not be necessary). If a mixing zone is allowed (see Chapter 1.2.2), dilution is also considered when calculating the critical effluent concentration by using either a steady-state or a dynamic model (see Chapter 1.2). If the critical effluent concentration is greater than the most stringent applicable criterion/objective for the pollutant, "reasonable potential" has been established and a water quality-based effluent limitation must be developed. The TSD also describes alternate methods for determining "reasonable potential", such as using stochastic models. Where available effluent and ambient data are insufficient to assess "reasonable potential", the TSD recommends that the permit writer use other information, if it exists, that indicates the presence of the pollutant in the discharge (such as facility type and plant process data), and require the discharger to monitor for the pollutant (see Chapter 2.2 on interim requirements). When sufficient pollutant data has been collected, the permit can be reopened and "reasonable potential" reassessed.

The same approach is further defined in the Guidance for NPDES Permit Issuance (GNPI) (U.S. EPA 1994), prepared by U.S. EPA, Region IX in cooperation with the SWRCB and RWQCBs. The GNPI specifically suggests using a steady-state mass balance equation (see

Chapter 1.2) to calculate the maximum downstream concentration of the pollutant after considering allowable dilution and then directly comparing this calculated value with the applicable criteria and objectives. If the calculated pollutant concentration is greater than the most stringent applicable water quality criterion or objective, "reasonable potential" has been established and an effluent limitation must be developed. Statistical analysis of the effluent variability is only performed if the difference between the calculated maximum downstream concentration and the criterion/objective is small (as judged by the permit writer). The statistical analysis, which is also described in the TSD, compensates for uncertainty related to sample size (the fewer monitoring samples that are available, the less probability of accurately characterizing the critical effluent concentration). A 99 percent confidence level and 99 percent probability basis is recommended in this guidance (the TSD will allow equations that calculate values at a lower confidence level and probability base). After the critical effluent concentration has been statistically projected, the maximum downstream concentration is calculated and compared with the applicable criteria/objectives. This method is described in greater detail in Alternative 2.

The Great Lakes Initiative (GLI) (U.S. EPA 1995) also applies a sequential process for determining "reasonable potential". The GLI method builds on the guidance found in the TSD, but steps of the process have been reversed. As in the TSD, the pollutants of concern, the applicable water quality criteria/objectives for the water body, and the allowable dilution are determined. In the next step, which is different from the TSD guidance, a preliminary effluent limitation (PEL) for each pollutant is calculated such that no applicable criterion or objective is exceeded downstream. The PEL is basically the applicable water quality criterion or objective adjusted to reflect an allowed dilution credit and background concentration, and is in that respect similar to the waste load allocation used in the TSD for calculating effluent limitations.

Unlike the TSD method for establishing "reasonable potential", the GLI method accounts for averaging periods of the applicable criteria/objectives and effluent data. The averaging period for the PEL is expressed as similar to the averaging period of the applicable criterion/objective and the effluent data as possible. For example, if the criterion/objective is a 1-hour acute aquatic life criterion/objective, the PEL is expressed as a daily limitation. The PEL for a 4-day chronic aquatic life criterion/objective is expressed as a weekly or monthly limitation, and the PEL for a 30-day human health criterion/objective is expressed as a monthly limitation.

Next, the projected effluent quality (PEQ) is determined as the 95 percent confidence level of the 95th percentile of the effluent concentration data (assuming a log-normal distribution) or the maximum observed effluent concentration, whichever is greater. As the last step, the PEQ is compared with the PEL. If the PEQ is greater than the PEL, then "reasonable potential" exists and an effluent limitation must be established. In essence, the TSD method uses the effluent data to project a maximum downstream concentration (considering dilution and background concentration) which is compared with the criterion or objective, whereas the GLI method uses the criterion or objective to calculate a preliminary effluent limitation (considering dilution and background concentration) which is compared with the effluent data. The GLI method is more refined than the TSD method because it attempts to match averaging periods and allows a more direct comparison of the criterion or objective with the effluent data. Alternative 3 is based on the GLI method for establishing “reasonable potential”, and describes the approach in greater detail.

In the absence of sufficient data to apply the method described above, the GLI recommends relying on existing regulations and procedures for determining “reasonable potential”. The GLI also allows a permitting authority to consider if the return of an identified intake water pollutant to the same water body under specified conditions will have “reasonable potential” to cause or contribute to an excursion of a water quality criterion or objective. The permitting authority may find that no “reasonable potential” exists for an intake water pollutant if the facility: (1) returns the intake water to the same water body; (2) does not contribute any additional mass of the pollutant; (3) does not increase the concentration of the pollutant; and (4) does not discharge at a time or location or alter the pollutant in a way that would cause adverse impacts to occur that would not occur if the pollutant was left in-stream. Option A allows consideration of intake water pollutants when establishing “reasonable potential” and is based on the GLI requirements. If “reasonable potential” is found to exist for the intake water pollutant, but there is no *net* addition of the pollutant, then effluent limitations may be derived that considers pollutants in the intake water. Establishing effluent limitations with a consideration of pollutants in the intake water is further discussed in Chapter 1.2.4.

Lacking a statewide policy, little consistency is found between RWQCBs in the procedures used for determining when effluent limitations are necessary to control discharged pollutants.

The San Francisco Bay Basin Plan requires water quality-based effluent limitations to be developed for all pollutants of concern unless dischargers certify that the pollutant is not present in the discharge and no change has occurred that may cause release of pollutants. This certification must be accompanied by monitoring results, and process and treatment descriptions, before issuance and reissuance of WDRs. Low volume discharges may be exempted from certification and monitoring if the discharges have been determined to have no significant adverse impact on water quality. The language in the rescinded ISWP and EBEP contained similar requirements. This approach minimizes the analysis required by the permit writer when determining reasonable potential, and may allow potential water quality problems to be detected and controlled early, because all pollutants, for which effluent limitations have been established, must be monitored regularly by dischargers. However, this approach levies a large monitoring and reporting demand on dischargers. RWQCBs must also calculate and enforce more effluent limitations, and must analyze more monitoring data, when this approach is taken. This approach is discussed further under Alternative 6.

If no requirements in the applicable basin plan for the selection of pollutants for establishing effluent limitations exist, a permit writer may rely on Federal guidance, guidance in other basin plans, the rescinded ISWP/EBEP, or other information, instead.

The Permitting and Compliance Issues Task Force made recommendations on “reasonable potential” determinations, among other issues. They recommended that the SWRCB adopt a statewide policy and provide methods for determining “reasonable potential”, as well as guidance on the use of any selected methods. Alternatives 2 through 7, described below, would establish a statewide policy and provide methods for determining “reasonable potential”. The task force also recommended that the SWRCB address pollutants in the intake water when determining “reasonable potential”. This recommendation is addressed in Option A. Many of the more specific recommendations of the task force regarding “reasonable potential” have not been developed as separate alternatives (e.g., the use of monitoring data below detection limits), but are included in the seven alternatives described below. Some of the task force recommendations are addressed in other subchapters. For example, provisions for establishing a monitoring program instead of final effluent limitations where available data are not adequate for determining “reasonable potential” have been addressed in Chapter 2.2 (Interim Requirements). Critical design flows are discussed in Chapter 1.2.2 (Mixing Zones), and the use of dissolved metals criteria are discussed in Chapter 1.2.1 (Metal Translators). Specific guidance on various situations related to “reasonable potential” determinations, such as considering seasonal variation, may be developed by SWRCB staff at a later date, when a general method for establishing “reasonable potential” has been adopted.

The seven alternatives below have been developed with an emphasis on various methods for determining when effluent limitations are necessary to control discharged pollutants. Due to the nature and methods of estimating “reasonable potential”, the alternatives presented below do not differ in their impact on the environment. Rather, differences in data requirements, ease of calculation, and regulatory demands are analyzed. In addition to the seven alternatives, three options are presented that complement Alternatives 2 and 3. Option A allows intake water pollutants to be considered when determining “reasonable potential”. Options B and C consider different confidence levels and percentiles (99/99 percent for Option B and 95/95 percent for Option C) when determining the critical effluent concentration. The options are discussed after the alternatives. The main features of the various alternatives and options are shown in Table V-1. ***[To access Table V-1, go to the "Table of Contents" and click on "List of Tables".]***

III. ALTERNATIVES FOR SWRCB ACTION

Alternative 1. No action. This alternative would defer to the RWQCBs for the selection of pollutants for which effluent limitations are necessary. The San Francisco Bay RWQCB would apply its basin plan provisions on selection of pollutants to the CTR criteria. This alternative would not address inconsistencies between RWQCBs, but would allow RWQCBs the flexibility to determine which methods better suit the individual regions.

Alternative 2. <u>Determine "reasonable potential" based on the general method described in the TSD and the GNPI</u>. RWQCBs would select pollutants for establishing effluent limitations by using the following procedure:

<u>Part A</u>.Where facility-specific effluent monitoring data are available, the RWQCB would determine "reasonable potential" by calculating a maximum projected downstream concentration and comparing it with the applicable criteria or objectives as follows:

<u>Step 1</u>.Determine the applicable water quality criteria or objectives for the receiving water body. Follow the steps outlined below for each pollutant for which criteria or objectives apply.

<u>Step 2</u>.Identify the maximum observed pollutant concentration in the undiluted effluent. If the pollutant is not detected in the effluent in any samples, the highest of the reported detection limits for the pollutant in the examined samples may be used in place of the maximum observed effluent concentration, at the RWQCBs discretion. If the reported detection limits for the pollutant in these samples are above any applicable criteria or objectives, the effluent data are considered insufficient for determining whether an effluent limitation is necessary (see part B for further instructions); otherwise, proceed with step 3.

<u>Step 3</u>.Calculate the projected critical effluent concentration (PEQ[2]) as follows:
Determine the total number of effluent samples. Determine the coefficient of variation (CV) (see Appendix B for definition) for the effluent data. For less than ten samples[3], CV may be set equal to 0.6, or a larger calculated value may be used. CV is calculated by dividing the estimated standard deviation (see Appendix B for definition) by the arithmetic mean (see Appendix B for definition). Locate the uncertainty factor in Table V-2 (if Option B is chosen) or Table V-3 (if Option C is chosen) that corresponds to the number of effluent samples and the calculated CV. ***[To access Tables V-2 and V-3, go to the "Table of Contents" and click on "List of Tables".]*** The uncertainty factor may also be calculated as follows:

a. First calculate the percentile (p) represented by the highest effluent concentration in the data set:
$p = (1 - \text{desired confidence level})^{1/n}$ where n is the number of samples.

b .Next calculate the uncertainty factor:
$\text{uncertainty factor} = \exp((z - z_p) * (\ln(CV^2 + 1))^{0.5})$
where z_p is the z-score associated with the probability p; and

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2 Identical to the PEQ in the GLI method for determining "reasonable potential".

3 Typical values for CV range from 0.2 to 1.2. A value of 0.6 is a relatively conservative estimate that may be used for CV when available data sets are small, and the uncertainty on the calculated standard deviation and arithmetic mean are, therefore, high (U.S. EPA 1991).

z is the z-score associated with the desired percentile (for a 99 percentile effluent concentration, z is 2.326).

Multiply the uncertainty factor with the maximum observed effluent concentration. The result is the PEQ.

<u>Step 4</u>. Determine allowable dilution, if applicable (see Chapter 1.2.2).

<u>Step 5</u>. If dilution is available, proceed with step 6. Otherwise, compare PEQ directly with the applicable criteria or objectives for the pollutant. An effluent limitation is necessary if the PEQ is greater than the applicable criteria or objectives.

<u>Step 6</u>. Calculate the projected maximum downstream concentration (MDC) using the following steady-state equation:

$MDC = (PEQ + B * D) / (1 + D)$

where B is the background concentration (see Chapter 1.2.3); and

D is the allowable dilution.

<u>Step 7</u>. Compare the MDC with the applicable criteria or objectives for the pollutant. An effluent limitation is necessary if the MDC is greater than the applicable criteria or objectives.

<u>Part B</u>. Where facility-specific effluent monitoring data are not available or are insufficient to determine “reasonable potential” using the above procedures, the RWQCB may determine "reasonable potential" based on other information that indicates the presence or amount of pollutant in the discharge (see the TSD for further discussion) and/or may require additional monitoring for the pollutant with detection limits below the criterion or objective (see Chapter 2.2 for further discussion). When sufficient data has been collected, the WDR can be reopened and “reasonable potential” reassessed.

Under this alternative, an effluent limitation would be established if an applicable criterion or objective is expected to be exceeded. This alternative would address many of the recommendations of the Permitting and Compliance Issues Task Force and provide statewide consistency. However, this alternative does not attempt to match the averaging period of the effluent data to the criterion or objective. Compared to Alternatives 4, 5, 6, and 7, this alternative would result in substantially fewer effluent limitations, reducing the monitoring and reporting demands for dischargers. Calculating and enforcing effluent limitations would be easier for RWQCBs than under Alternatives 4, 5, 6, and 7, but determining “reasonable potential” under this alternative requires more calculations and data. This alternative would probably result in the same number of effluent limitations as Alternative 3.

Alternative 3. <u>Determine “reasonable potential” based on the general method described in the GLI, but with no special provisions for intake water pollutants</u>. RWQCBs would follow these steps when determining “reasonable potential”:

Part A. Where facility-specific effluent monitoring data are available, the RWQCB would determine "reasonable potential" by developing a PEL and comparing it with the PEQ of the discharge as follows:

Step 1. Determine the applicable water quality criteria or objectives for the receiving water body. Follow the steps outlined below for each pollutant for which criteria or objectives apply.

Step 2. Determine allowable dilution, if applicable (see Chapter 1.2.2).

Step 3. Calculate the PEL(s) using a steady-state equation:

$$PEL = C + D (C - B)$$

where C is the criterion or objective;
D is the allowable dilution; and
B is the background concentration (see Chapter 1.2.2).

If the background concentration exceeds the criterion or objective or no dilution is allowed, PEL is set equal to the criterion/objective. The PEL based on a human health criterion/objective is expressed as a monthly limitation. The PEL based on an acute aquatic life criterion/objective is expressed as a daily limitation. The PEL based on a chronic aquatic life criterion/objective is expressed as a weekly limitation.

Step 4. Identify the maximum observed pollutant concentration for the undiluted effluent. If the pollutant was not detected in the effluent in any samples, the highest of the reported detection limits for the pollutant may be used in place of the maximum observed effluent concentration, at the RWQCB's discretion. If reported detection limits are above the applicable criteria or objectives, the effluent data are considered insufficient to determine whether an effluent limitation is necessary (see part B for further instructions); otherwise, proceed with step 5.

Step 5. Compare the maximum observed effluent concentration to the PEL. An effluent limitation is necessary if the maximum observed effluent concentration is greater than the PEL. Otherwise, proceed with step 6.

Step 6. Calculate the PEQ as follows: Determine the total number of effluent samples. Find the coefficient of variation (CV) for the effluent data. For less than ten samples, CV may be set equal to 0.6, or a larger calculated value may be used. Otherwise, determine CV for the effluent data by dividing the standard deviation by the arithmetic mean. Locate the uncertainty factor in Table V-2 or Table V-3 that corresponds to the number of effluent samples and the calculated CV. The uncertainty factor may also be calculated as described under Alternative 2, step 3. Multiply the uncertainty factor with the maximum observed effluent concentration. The result is the PEQ.

Step 7. Compare the PEQ with the PEL. An effluent limitation is necessary if the PEQ is greater than the PEL.

Part B. Where facility-specific effluent monitoring data are not available or are insufficient to determine “reasonable potential” using the above procedures, the RWQCB may determine "reasonable potential" based on other information that indicates the presence or amount of pollutant in the discharge (see the TSD for further discussion) and/or may require additional monitoring for the pollutant with detection limits below the criterion or objective (see Chapter 2.2 for further discussion). When sufficient data has been collected, the WDR can be reopened and “reasonable potential” reassessed.

Under this alternative, an effluent limitation would be established if an applicable criterion or objective is expected to be exceeded. Like Alternative 2, this alternative would address many of the recommendations of the Permitting and Compliance Issues Task Force and provide statewide consistency and is the only alternative that attempts to match the averaging period of the criterion/objective to the effluent data. Furthermore, because the effluent data can be compared directly to the PEL, it is easier for the permit writers to consider all of the effluent data when determining “reasonable potential”. Compared to Alternatives 4, 5, 6, and 7, this alternative would require substantially fewer effluent limitations, thus reducing monitoring, reporting, and enforcement requirements. However, determining “reasonable potential” under this alternative requires more calculations and data than under Alternatives 4, 5, 6, and 7.

Alternative 4. Require effluent limitations for priority pollutants present in the receiving water at levels above any applicable water quality criterion/objective or present in the discharger’s undiluted effluent at levels above the background concentration or above any applicable water quality criterion/objective. RWQCBs would select pollutants for establishing effluent limitations by using the following procedure:

Part A. Where facility-specific effluent monitoring data are available, the RWQCB would determine “reasonable potential” as follows:

Step 1. Determine the applicable water quality criteria or objectives for the receiving water body. Follow the steps outlined below for each pollutant for which criteria or objectives apply.

Step 2. Identify the maximum observed pollutant concentration for the undiluted effluent. If the pollutant was not detected in the effluent in any samples, the highest of the reported detection limits for the pollutant may be used in place of the maximum observed effluent concentration, at the RWQCB’s discretion. Proceed with step 3. (If reported detection limits are at, or above, any applicable criteria or objectives, first check if the background concentration is greater than applicable criteria or objectives (see step 6), requiring an effluent limitation to be established for the pollutant; if not, go to part B.)

Step 3. Compare the maximum observed effluent concentration with the applicable criteria or objectives for the pollutant. An effluent limitation is necessary if the maximum observed effluent concentration is greater than any of the applicable criteria or objectives. Otherwise, proceed with step 4.

Step 4. Determine the background concentration as described in Chapter 1.2.3. If the background concentration cannot be determined due to lack of data, compare the maximum observed effluent concentration to a value that equals half of the most stringent criterion or objective. An effluent limitation is necessary if the maximum observed effluent concentration is greater than half of the criterion or objective. Otherwise, proceed with step 5.

Step 5. Compare the maximum observed effluent concentration to the background concentration. An effluent limitation is necessary if the maximum observed effluent concentration is greater than the background concentration. Otherwise, proceed with step 6.

Step 6. Compare the background concentration with the applicable criteria or objectives for the pollutant. An effluent limitation is necessary if the background concentration is greater than any of the applicable criteria or objectives.

Part B. Where facility-specific effluent monitoring data are not available or are insufficient to determine “reasonable potential” using the above procedures, the RWQCB may determine "reasonable potential" based on other information that indicates the presence or amount of pollutant in the discharge (see the TSD for further discussion) and/or may require additional monitoring for the pollutant with detection limits below the criterion or objective (see Chapter 2.2 for further discussion). When sufficient data has been collected, the WDR can be reopened and “reasonable potential” reassessed.

Under this alternative, an effluent limitation would be established for a pollutant, if any applicable criterion or objective was not met in the receiving water, or if the pollutant concentration in the discharge was greater than any applicable criterion or objective or the receiving water concentration. This alternative would provide statewide consistency. It would result in fewer effluent limitations than Alternatives 5, 6, and 7, but more than Alternatives 2 and 3. Where facility-specific effluent monitoring data are available, this alternative requires more calculations and data than Alternatives 5, 6, and 7, but less than Alternatives 2 and 3.

Alternative 5. Require effluent limitations for priority pollutants detected in the discharger’s effluent. Where facility-specific effluent monitoring data are available, the RWQCB would make a “reasonable potential” determination by using the following method:

Step 1. Determine the applicable water quality criteria or objectives for the receiving water body.

Step 2. Determine if the pollutants, for which criteria or objectives apply, have been detected in the discharger's effluent. An effluent limitation is necessary if the pollutant has been detected in the effluent. If reported detection limits for all samples are above any applicable criteria or objectives, the effluent data are considered insufficient to determine whether an effluent limitation is necessary, the RWQCB may determine "reasonable potential" based on other information that indicates the presence or amount of pollutant in the discharge (see the TSD for further discussion) and/or may require additional monitoring for the pollutant with detection limits below the criterion or objective (see Chapter 2.2 for further discussion). When sufficient data has been collected, the WDR can be reopened and "reasonable potential" reassessed.

Determining "reasonable potential" would be simpler for permit writers under this alternative than under Alternatives 2, 3, or 4 because no calculations would be required and only effluent pollutant data would be needed. However, in comparison, more effluent limitations would need to be calculated and enforced, and the monitoring and reporting requirements for dischargers would be greater. This alternative would provide statewide consistency.

Alternative 6. Require effluent limitations for priority pollutants that are not certified to be absent in the discharger's effluent. Under this alternative, the RWQCB would make a "reasonable potential" determination by using the following method:

Step 1. Determine the applicable water quality criteria or objectives for the receiving water body.

Step 2. Effluent limitations are necessary for all pollutants, for which criteria or objectives apply, unless a discharger certifies to the satisfaction of the RWQCB that a pollutant is not present in the discharge and that no source has been identified or process change has occurred which could result in the presence of the pollutant in the discharge. The certification needs to be accompanied by monitoring results, and process and treatment descriptions. It is the responsibility of the discharger to provide monitoring results and other information used for certification purposes to the RWQCB before issuance and reissuance of a WDR. The RWQCBs may choose to forego certification and periodic monitoring for priority pollutants in low volume discharges determined to not adversely impact water quality.

This alternative would be simpler to implement than any of the above alternatives because no calculations or data would be required; however, more effluent limitations would need to be calculated and established. The monitoring, reporting, and regulatory requirements would, therefore, be greater for this alternative. The certification process may prove cumbersome. This alternative would provide statewide consistency and is consistent with the San Francisco Bay Basin Plan and the rescinded ISWP and EBEP.

Alternative 7. Require effluent limitations for all priority pollutants. The RWQCB would make a "reasonable potential" determination by using the following method:

Step 1. Determine the applicable water quality criteria or objectives for the receiving water body.

Step 2. Effluent limitations are necessary for all pollutants for which criteria or objectives apply.

This alternative would be simpler to implement than the other alternatives because no data, calculations, data analysis, or certification is required. However, the monitoring, reporting, and regulatory demands would be greater for this alternative than for the other alternatives, because more effluent limitations would need to be calculated and established. This alternative would provide statewide consistency, but could be considered arbitrary because dischargers could be required to encur costs for monitoring and reporting that would be unjustified in some circumstances.

Options that may supplement Alternatives 2 and 3:

Option A. Consider pollutants in the intake water when determining “reasonable potential" (may be combined with Alternatives 2 and 3). Selection of this option would allow the RWQCBs to determine that the return of an identified intake water pollutant to the same water body under specified circumstances would not cause, have the reasonable potential to cause, or contribute to an excursion above applicable criteria or objectives. An effluent limitation would not be required for a pass-through intake water pollutant if the following conditions were met: (a) the water quality criterion/objective is exceeded in the water body immediately upstream of the facility’s intake and discharge points, and no TMDL for the discharge has been prepared; (b) the facility’s intake is located in the vicinity of and in the same water body as the discharge point; (c) the facility withdraws 100 percent of the intake water containing the pollutant from the same water body into which the discharge is made; (d) the facility does not contribute any mass of the identified intake pollutant to its intake water or discharge (i.e., the pollutant present in the discharge must be due exclusively to its presence in the intake water from the receiving water body); (e) the concentration of the pollutant in the intake water is identical to the concentration of pollutant in the receiving water; (f) the concentration of the pollutant in the discharge is not higher than the concentration of the pollutant in the receiving water; and (g) the pollutant was not discharged at a time or location, nor altered so that it would cause adverse impacts to occur that would not otherwise occur, if the pollutant was left in-stream. If a RWQCB determined that “reasonable potential” was established for an intake water pollutant, water quality-based effluent limitations would be established for intake water pollutants according to Chapter 1.2.4.

When the above listed conditions are met, the GLI allows the permit writer to find that the intake water pollutant has no greater impact on the receiving water than if the discharger had not diverted and returned the intake water pollutant to the same body of water, and that the intake water pollutant, therefore, does not exhibit “reasonable potential”. Implementation of this option would probably reduce the number of effluent limitations slightly. Receiving water quality is likely to remain unchanged.

Option B. <u>Determine the critical effluent concentration as the 99th percentile concentration with a 99 percent confidence level (may be combined with Alternatives 2 and 3)</u>. Table V-2 is used to find the uncertainty factor. This option was recommended in the GNPI and is more conservative than Option C.

Option C. <u>Determine the critical effluent concentration as the 95th percentile concentration with a 95 percent confidence level (may be combined with Alternatives 2 and 3)</u>. Table V-3 is used to find the uncertainty factor. This option was used in the GLI and is less conservative than Option B.

IV. STAFF RECOMMENDATION

Adopt Alternative 4.

CHAPTER 1.2 CALCULATION OF EFFLUENT LIMITATIONS

I. PRESENT STATE POLICY

Currently, no statewide policy exists that stipulates how water quality-based effluent limitations for the inland surface waters, enclosed bays, and estuaries of California should be calculated. Most of the basin plans for the RWQCBs also do not provide detailed instructions on calculating water quality-based effluent limitations, but refer to or list various methods described in State and Federal documents. Only the 1995 basin plan for the San Francisco Bay RWQCB specifies that a particular method be used for calculating water quality-based effluent limitations. The San Francisco Bay Basin Plan requires that a steady-state mass balance equation be used to directly calculate water quality-based effluent limitations when ambient concentrations are equal to or less than the water quality criteria. The mass balance equation considers dilution credit, and the water quality objective and the ambient background concentration of each substance. The Ocean Plan applies a similar steady-state mass balance equation for calculation of water quality-based effluent limitations.

II. ISSUE DESCRIPTION

Effluent limitations are restrictions in permits imposed on the concentrations, discharge rates, and quantities of discharged pollutants. Water quality-based effluent limitations are established for discharges when necessary to ensure that the water quality of the receiving water is attained or maintained at a level that protects the associated beneficial uses. Federal NPDES regulations (40 CFR 122.44 (d)), and the California Code of Regulations (CCR, Title

23, Chapters 3 and 4) provide the overall framework for establishing water quality-based effluent limitations.

Water quality-based effluent limitations are required for all pollutants in a point-source discharge that cause, have the reasonable potential to cause, or contribute to an excursion (defined in Appendix B) above a water quality criterion (40 CFR 122.44 (d)(1)(iii)). Selection of pollutants for calculating water quality-based effluent limitations is discussed in Chapter 1.1. Federal regulations (40 CFR 122.44 (d)(1)(vii)) require that water quality-based effluent limitations be derived from and comply with all applicable water quality standards, and be consistent with the assumptions and requirements of applicable, approved waste load allocations (WLAs) (see Chapter 5.5). The permit writer must consider water quality criteria, beneficial uses and conditions of the receiving water, effluent variability, applicable dilution, compliance monitoring frequency, and existing controls on point and nonpoint sources of pollution such as technology-based effluent limitations and Total Maximum Daily Loads (TMDLs) (see Chapter 5.5) when developing water quality-based effluent limitations. The effluent limitation must protect against both acute and chronic impacts. The permit writer must impose more restrictive limitations where necessary for the protection of beneficial uses or where otherwise required by law.

The water quality criteria contained in the CTR provide a foundation from which water quality-based effluent limitations can be derived. The CTR criteria are expressed as 1-hour averages and/or 4-day averages for protection of aquatic life, and 30-day averages for protection of human health. Based on the CTR criteria, a waste load allocation is derived that must be converted to appropriate water quality-based effluent limitations. Federal regulations (40 CFR 122.45) require that water quality-based effluent limitations generally be expressed as average weekly limitations (defined in Appendix B) and average monthly limitations (defined in Appendix B) for POTWs, and maximum daily limitations (defined in Appendix B) and average monthly limitations for all discharges other than POTWs.

These regulations also require that all pollutants in NPDES permits have effluent limitations expressed in terms of mass, unless it is inappropriate to do so (40 CFR 122.45(f)). The U.S. EPA considers mass limitations to be necessary to prevent the use of dilution as a means of treatment, and finds mass limitations a valuable regulatory tool in many discharge situations (U.S. EPA 1995). For example, mass limitations may enable a POTW to better control bioaccumulative substances from indirect dischargers and aid in establishing TMDLs. Effluent limitations may also be expressed in terms of concentration or other unit of measurement, and the discharger must comply with all limitations (40 CFR 122.45(f)).

While Federal and State regulations describe the permit conditions and the issuance process, they do not, however, specify a method for calculating water quality-based effluent limitations, which is the main subject of this chapter. However, several guidance documents exist. The U.S. EPA has provided detailed technical guidance on various methods of calculating water quality-based effluent limitations in the Technical Support Document for Water Quality-based Toxics Control (TSD) (U.S. EPA 1991). The Guidance for NPDES

Permit Issuance (GNPI)(U.S. EPA 1994) was written specifically for California permit writers by U.S. Region IX with assistance from the SWRCB and the RWQCBs. This guidance builds on the technical guidance in the TSD, but is more specific.

The TSD describes several methods for calculating water quality-based effluent limitations that rely on mass balance equations to predict ambient water concentrations and to calculate the effluent quality required to meet water quality criteria. These methods can generally be divided into steady-state models and dynamic models.

The U.S. EPA recommends that a steady-state model be used to derive water quality-based effluent limitations in most cases. Steady-state models use a single constant value as input for each variable. Variables include effluent concentration, effluent flow, background concentration, and receiving water flow. Critical conditions are usually assumed for each variable when steady-state models are used, because the calculated water quality-based effluent limitations must protect against excursions of criteria under a variety of conditions. The assumed combination of critical conditions may never occur, leading to water quality-based effluent limitations that are more stringent than necessary to meet water quality criteria or objectives in the receiving water body. Conversely, if the assumed values for the variables do not represent critical conditions because of insufficient data or incorrect assumptions, the derived water quality-based effluent limitations may not be protective enough.

Dynamic models require much more data than steady-state models because the variability of the data and interactions between the variables are considered; however, they generally also produce more accurate water quality-based effluent limitations. Averaging periods, exceedance frequencies, complex mixing situations, pollutant fate and transport, pollutant interactions, and other factors can often be incorporated into dynamic models. U.S. EPA recommends that a dynamic model be used to derive water quality-based effluent limitations if sufficient data exist (typically, sufficient data will not be available), and time and resources are available. The TSD recommends three types of dynamic models: continuous simulation, Monte Carlo simulation, and log-normal probability modeling. All three types calculate probability distributions of downstream concentrations from which the allowable water quality-based effluent limitations can be derived.

Continuous simulation models predict downstream concentrations in chronological order based on daily historical data. Monte Carlo simulation models randomly generate downstream concentrations based on probability distributions of each variable such as effluent flow, effluent concentrations, etc. Log-normal probability models use the log-normal probability distributions of the variables to calculate probability distributions of the downstream concentrations. Continuous simulation requires the most data (about 20-25 years of continuous flow data); Monte Carlo simulation requires less data that are not required to be in chronological order; and log-normal probability modeling only requires the statistical parameters of the input variables.

Generally, when using a steady-state equation for calculating water quality-based effluent limitations, the U.S. EPA guidance recommend that permit writers use the following procedure: First, the water quality standards applicable to the water body are identified. Then, it is determined which of the pollutants in the discharge need to be controlled by establishing water quality-based effluent limitations (see Chapter 1.1). Next, WLAs are calculated for each pollutant for which water quality-based effluent limitations are necessary. Where a TMDL exists, the WLA is that portion of the allowable load assigned to a particular discharge. Where a TMDL does not exist, a steady-state mass balance model is generally recommended for deriving WLAs, unless there are sufficient data, time, and resources to use a dynamic model. The following steady-state mass balance equation is generally used:

$$Cd * Qd = Cu * Qu + Ce * Qe \quad \rightleftharpoons \text{ which solved for } Ce \text{ is}$$
$$Ce = WLA = (Cd * Qd - Cu * Qu) / Qe \quad \rightleftharpoons \text{ because } Qd = Qu + Qe$$
$$Ce = WLA = (Cd * (Qu + Qe) - Cu * Qu) / Qe \quad \rightleftharpoons \text{ which can be rearranged to}$$
$$Ce = WLA = Cd * Qu/Qe + Cd * Qe/Qe - Cu * Qu/Qe \quad \rightleftharpoons \text{ which can be rearranged to}$$
$$Ce = WLA = Cd + Qu/Qe * (Cd - Cu)$$

where C = pollutant concentration
Q = flow
d = downstream from the discharge point
u = upstream from the discharge point
e = effluent

The initial equation assumes that the pollutant is conservative, i.e., it stays in the water column and does not immediately decay. The downstream pollutant mass (found by multiplying the concentration with the flow) can therefore be found by adding the effluent pollutant mass to the pollutant mass upstream of the discharge. The units for the concentrations should be identical and the units for the flows should be identical. *Ce* is the allowable effluent concentration or WLA, *Cd* is the numeric protective level (usually the water quality criterion adjusted, if necessary, for hardness, pH, and metals translators (see Chapter 1.2.1), and *Cu* is the ambient background concentration. *Qu/Qe* is the available dilution (see Chapter 1.2.2).

Once the WLA has been calculated, it must be translated into maximum daily, average weekly, and/or average monthly water quality-based effluent limitations because the WLA does not account for effluent variability, uncertainty related to sample size, averaging periods, and exceedance frequencies. Using the WLA directly as an effluent limitation may result in an overly stringent effluent limitation which may cause compliance problems for the discharger or, conversely, may result in an overly lenient effluent limitation that does not adequately protect water quality. The U.S. EPA, therefore, recommends a statistical procedure to convert the WLA into water quality-based effluent limitations.

The WLAs are used to define the long-term average discharge conditions (LTA) that will maintain water quality at a level that will meet applicable water quality standards. Acute and chronic LTAs are calculated and the lowest (most limiting) LTA is found. For WLAs calculated based on human health criteria, the LTA is set equal to the WLA:

$$LTA_{human\ health} = WLA_{human\ health}$$

For WLAs calculated based on aquatic life criteria, the LTA is determined by multiplying the WLA with a factor (the WLA multiplier):

$$LTA_{acute\ aquatic} = WLA_{acute\ aquatic} * \text{Acute factor}$$
$$LTA_{chronic\ aquatic} = WLA_{chronic\ aquatic} * \text{Chronic factor}$$

The value of the WLA multiplier depends on the number of effluent concentration data points, the standard deviation of the effluent concentration data, the occurrence probability desired, and whether the criterion used for calculating the WLA is an acute or chronic aquatic life criterion. The WLA can be calculated as follows:

$$\text{Acute factor} = \exp(0.5\ \sigma^2 - z * \sigma)$$
$$\text{Chronic factor} = \exp(0.5\ \sigma_4^2 - z * \sigma_4)$$

where:

σ^2 = ln (CV^2 + 1);
σ_4^2 = ln (CV^2/4 + 1); and
z = z-score for the probability desired for the WLA multiplier

The U.S. EPA recommends using a 99th percentile occurrence probability (z = 2.326) to calculate both acute and chronic LTAs, although other occurrence probabilities are allowed. Rather than calculating the LTA factors, these factors can be found in Table V-4 based on a 99th percentile occurrence probability. ***[To access Table V-4, go to the "Table of Contents" and click on "List of Tables".]*** To use Table V-4, the coefficient of variation (*CV*) for the effluent data must be calculated by dividing the standard deviation (see Appendix B) of the data by the arithmetic mean (see Appendix B). If the number of effluent data points is less than ten[1], the *CV* may be set equal to 0.6, or a larger calculated value may be used. The factor that corresponds to the calculated *CV* can then be found in Table V-4. The lowest (most limiting) of calculated LTAs for a pollutant should be selected for deriving water quality-based effluent limitations.

Appropriate water quality-based effluent limitations are calculated by multiplying the lowest LTA with a factor that adjusts for averaging periods, exceedance frequency, and effluent monitoring frequency. The factor varies depending on whether the lowest LTA is based on a human health criterion or an aquatic life criterion:

[1] Typical values for CV range from 0.2 to 1.2. A value of 0.6 is a relatively conservative estimate that may be used for CV when available data sets are small, and the uncertainty on the calculated standard deviation and arithmetic mean therefore high (U.S. EPA 1991).

For an LTA based on a human health criterion:
Average monthly limitation (AML) = *LTA*
Maximum daily limitation (MDL) = *Average monthly limitation* $*$ *MDL/AML multiplier*

For an LTA based on an aquatic life criterion:
Average monthly limitation = *LTA* $*$ *AML multiplier*
Maximum daily limitation = *LTA* $*$ *MDL multiplier*

The MDL/AML multiplier, the AML multiplier, and the MDL multiplier are calculated based on the monthly sampling frequency, the standard deviation of the effluent concentration data, and the occurrence probability desired:

$$\text{MDL multiplier} = \exp(-0.5\,\sigma^2 + z_1 * \sigma)$$
$$\text{AML multiplier} = \exp(-0.5\,\sigma_n^2 + z_2 * \sigma_n)$$
$$\text{MDL/AML multiplier} = \text{MDL multiplier} / \text{AML multiplier} = \exp(-0.5\,\sigma^2 + z_1 * \sigma) / \exp(-0.5\,\sigma_n^2 + z_2 * \sigma_n) = \exp(\sigma * (z_1 - z_2))$$

where:
σ^2 = ln $[CV^2 + 1]$;
σ_n^2 = ln $[CV^2/n + 1]$;
z_1 = z-score for the probability desired for the MDL multiplier;
z_2 = z-score for the probability desired for the MDL multiplier; and
n = monthly sampling frequency.

The U.S. EPA guidance recommends using a 99th percentile occurrence probability for the MDL multiplier (z_1 = 2.326) and a 95th percentile occurrence probability for the AML multiplier (z_2 = 1.645) , but will allow a lower confidence level and probability base to be used. The U.S. EPA guidance does not specifically recommend a percentile occurrence probability to use for the MDL/AML multiplier, but the percentiles used for the MDL/AML multiplier should reflect the percentiles used for the MDL multiplier and the AML multiplier.

Table V-5 contains values for the MDL, AML, and MDL/AML multipliers calculated using the percentiles recommended in the U.S. EPA guidance. ***[To access Table V-5, go to the "Table of Contents" and click on "List of Tables".]*** The correct multiplier can be located in the table by using the previously calculated *CV* and the monthly sampling frequency. The TSD recommends that if the sampling frequency is once a month or less, that the monthly sampling frequency (n) be set equal to 4, in order to get valid results. The TSD also recommends that maximum daily limitations be used in place of average weekly limitations for POTWs, as it is for non-POTWs.

Finally, the calculated water quality-based effluent limitations are compared with the technology-based effluent limitations for the pollutant, and the most protective of the limitations are included in the permit. Mass-based effluent limitations (in terms of pounds per day or kilograms per day) are calculated by multiplying the most protective of the limitations with the mean daily mean effluent flow and appropriate conversion factors (to adjust the units of the flow and the concentration- and mass-based limitations). The U.S. EPA recommended method has been incorporated into Alternative 2.

The rescinded ISWP and EBEP listed a number of methods from which the permit writer could choose when developing water quality-based effluent limitations:

a. assigning of a portion of the loading capacity of the receiving water to each source of waste, point and nonpoint;

b. using a steady-state mass balance equation:

$$C_e = C_d + D\,(C_d - C_u), \qquad \text{when } C_d \succ C_u, \text{ and}$$
$$C_e = C_d, \qquad \text{when } C_d \preceq C_u,$$

where D = the allocated dilution ratio, expressed as parts receiving water per part wastewater (Qu/Qe) based on mixing zone provisions. (The other variables have been described above. This equation is similar to the equation used in the U.S. EPA guidance);

c. applying the statistical-based approach described in the TSD, where sufficient effluent and receiving water data exist;

d. using discharge prohibitions to implement water quality criteria for a particular area; or

e. for power plant discharges, using the steady-state equation:

$$C_e = C_d\ (D_c + 1)$$

where D_c = the combined in-plant waste stream. (The other variables have been described above.)

The method described in the rescinded ISWP and EBEP has been incorporated into Alternative 3. The Ocean Plan and the San Francisco Bay Basin Plan use a steady-state mass balance equation identical to the equation used in the rescinded ISWP and EBEP for non-power plant discharges. The equations differ only in how the variables are defined. Unlike the rescinded ISWP and EBEP, however, the California Ocean Plan and the San Francisco Bay Basin Plan do not offer a choice of methods for calculation of water quality-based effluent limitations. The rescinded ISWP and EBEP did not specify how mass-based effluent limitations should be calculated.

The Permitting and Compliance Issues Task Force also made recommendations on calculating water quality-based effluent limitations. The task force recommendations are very similar to the U.S. EPA recommendations. The task force suggested that derived water quality-based effluent limitations be consistent with the averaging period and exceedance frequency of the criteria. They recommended that the steady-state mass balance model, described earlier, be used for calculating water quality-based effluent limitations in most cases, but that dischargers be allowed to develop sufficient data and calculate water quality-based effluent limitations based on an acceptable dynamic model described in the TSD. The task force recommended that the procedures listed in Chapter 5 of the TSD be followed when calculating water quality-based effluent limitations, but made no specific recommendations on which percentile occurrence probability should be used. The task force recommended that daily mass limitations be calculated as the product of the maximum daily limitation and the maximum daily flow expected at the end of the permit term, and that monthly mass limitation be calculated as the product of the average monthly limitation and the maximum monthly flow expected at the end of the permit term. The task force recommendations on the calculation of water quality-based effluent limitations have largely been incorporated into Alternative 2.

III. ALTERNATIVES FOR SWRCB ACTION

Alternative 1. No action. The method of calculating water quality-based effluent limitations would be deferred to the RWQCBs. This approach would allow RWQCBs flexibility, but would reduce statewide consistency.

Alternative 2. Calculate water quality-based effluent limitations based on the U.S. EPA guidance. Under this alternative, when a RWQCB determines (using procedures described in Chapter 1.1) that water quality-based effluent limitations are necessary to control a pollutant in a discharge, these water quality-based effluent limitations must be developed using one or more of the following methods:

a. RWQCBs may assign a portion of the loading capacity of the receiving water to each source of waste, point and nonpoint (see Chapter 5.5);

b. RWQCBs may use the following procedure:

Step 1: Identify applicable water quality criteria for the pollutant.

Step 2: For each water quality criterion, calculate the waste load allocation (*WLA*) using the following steady-state mass balance equation:

$$WLA = C + D\,(C - B) \qquad \text{when } C > B, \text{ and}$$
$$WLA = C \qquad \text{when } C \leq B,$$

where C = the numeric protective level (usually the water quality criterion adjusted, if necessary, for hardness, pH, and translators (see Chapter 1.2.1 for discussion of translators));

D = the dilution credit as determined in Chapter 1.2.2; and

B = the ambient background concentration as determined in Chapter 1.2.3.

The concentration units for C and B must be identical; the dilution credit is unitless.

<u>Step 3:</u> For each *WLA*, determine the long-term average discharge condition (*LTA*). For a *WLA* calculated based on a human health criterion, set the *LTA* equal to the *WLA*. For a *WLA* based on aquatic life criteria, determine the *LTA* by multiplying the *WLA* with a factor that adjusts for effluent variability. The factor can be calculated as described earlier, but is easier found by using Table V-4. To use Table V-4, the coefficient of variation (*CV*) (see Appendix B) for the effluent pollutant concentration data must first be calculated. If the number of effluent data points is less than ten, the *CV* may be set equal to 0.6, or a larger calculated value may be used. When calculating *CV* in this procedure, if an effluent data point is below the detection limit for the pollutant in that sample, the reported detection limit may be used as a value in the calculations. The factor that corresponds to the *CV* and the acute or chronic criteria can then be found in Table V-4.

<u>Step 4:</u> Select the lowest (most limiting) of the calculated *LTA*s for the pollutant.

<u>Step 5:</u> Calculate water quality-based effluent limitations by multiplying the limiting *LTA* with a multiplier that adjusts for the averaging periods and exceedance frequencies of the criteria and the water quality-based effluent limitations, and the effluent monitoring frequency. If the limiting *LTA* was based on a human health criterion, water quality-based effluent limitations are calculated as follows:

Average monthly limitation (AML) = *LTA*
Maximum daily limitation (MDL) = *LTA* ∗ *MDL/AML multiplier*

If the limiting LTA was based on an aquatic life criterion, water quality-based effluent limitations are calculated as follows:

Average monthly limitation = *LTA* ∗ *AML multiplier*
Maximum daily limitation = *LTA* ∗ *MDL multiplier*

The MDL/AML multiplier, the AML multiplier, and the MDL multiplier can be calculated as described earlier, but are easier found by using Table V-5. The correct multiplier can be found by using the previously calculated *CV* and the monthly sampling frequency (n) of the pollutant in the effluent. If the sampling frequency is once a month or less, n must be set equal to 4. For this method, maximum daily limitations must be used for POTWs in place of average weekly limitations.

c. RWQCBs may elect to apply an acceptable dynamic model, where sufficient effluent and receiving water data exist;

d. RWQCBs may use discharge prohibitions to implement water quality criteria for a particular area; or

e. RWQCBs may establish water quality-based effluent limitations that considers intake water pollutants according to Chapter 1.2.4.

Regardless of which method is used for deriving water quality-based effluent limitations, the calculated water quality-based effluent limitations are compared to the technology-based effluent limitations for the pollutant. The most protective of the two types of limitations must be included in the permit. Mass limitations must be calculated for each of the CTR criteria limited in an NPDES permit, unless it is inappropriate to do so, by multiplying the most protective of the limitations with the mean daily mean effluent flow and appropriate conversion factors to adjust units. Effluent limitations may also be expressed in terms of concentration or other unit of measurement, and the discharger must comply with all limitations.

This alternative is more complicated to implement than Alternative 3, because more calculations are involved. However, this method adjusts for effluent variability, sample size, monitoring frequency, and differences between the averaging periods and exceedance frequencies of the criteria and the water quality-based effluent limitations. Therefore, water quality-based effluent limitations derived using this method would have a much lower probability of leading to excursions above the water quality criteria in the receiving water. This alternative furthermore addresses recommendations of the Permitting and Compliance Task Force, and is based on methods described in the TSD, and the GNPI**.**

Alternative 3. <u>Calculate water quality-based effluent limitations as described in the rescinded ISWP and EBEP, and the San Francisco Bay Basin Plan.</u> Same as Alternative 2, except that method (b) would be as follows:

b. RWQCBs may use the following procedure:

<u>Step 1:</u> Identify applicable water quality criteria for the pollutant.

<u>Step 2:</u> For each water quality criteria, calculate the water quality-based effflluent limitation using the following steady-state mass balance equation:

Water quality-based effluent limitation = $C + D(C - B)$ *when* $C > B$, *and*
Water quality-based effluent limitation = C *when* $C \leq B$,

where C = the numeric protective level (usually the water quality criterion adjusted, if necessary, for hardness, pH, and translators (see Chapter 1.2.1));
D = the dilution credit as determined in Chapter 1.2.2; and
B = the ambient background concentration as determined in Chapter 1.2.3.

The concentration units for *C* and *B* must be identical; the dilution credit is unitless.

This alternative is easier for the permit writer to implement than Alternative 2, because less calculations are involved. However, this alternative does not adjust for effluent variability, sample size, monitoring frequency, or the differences between the averaging periods and exceedance frequencies of the criteria and the water quality-based effluent limitations. Nor does this method describe how maximum daily limitations are to be derived from a 30-day human health criterion or how to determine which of the applicable criteria is more stringent. As a result, water quality-based effluent limitations derived using this method may be too lenient, resulting in excursions above the criteria in the receiving water, or conversely, may produce overly stringent water quality-based effluent limitations which the dischargers may have difficulty meeting.

IV. STAFF RECOMMENDATION

Adopt Alternative 2.

CHAPTER 1.2.1 TRANSLATORS FOR METALS AND SELENIUM

I. PRESENT STATE POLICY

Currently, there is no statewide policy on the translation of metals and selenium (a metalloid) criteria that are expressed in the dissolved form into total recoverable effluent limitations (permit limits). The metals objectives in the Ocean Plan and the San Francisco Bay Basin Plan are expressed as total recoverable; therefore, a translator is not needed. The Central Valley Basin Plan expresses the metals objectives as dissolved and the selenium objectives as total recoverable; translators for these objectives are not addressed in the basin plan. The Santa Ana Basin Plan includes site-specific objectives for three metals (that apply to segments of the Santa Ana River) which are expressed as dissolved. Although not contained in their basin plan, the Santa Ana RWQCB uses the translators that were developed during the site-specific objectives study for these metals (i.e., 0.26 for cadmium and copper, and 0.61 for lead). The other basin plans either express metals objectives as total recoverable or do not contain objectives for metals.

II. ISSUE DESCRIPTION

Metals and selenium[1] can be expressed and measured in concentrations of either dissolved, acid-soluble, total recoverable, or total.[2] The Federal regulation at 40 CFR 122.45(c) requires that, in most instances, effluent limitations for metals be expressed as total recoverable.[3] Therefore, if a water quality criterion for a metal is expressed in a form other than total recoverable, the criterion must be "translated" into a total recoverable effluent limitation that will achieve water quality standards.

With the exception of the fresh water chronic criteria for selenium, the CTR criteria for metals and selenium are expressed as the dissolved fraction.[4] The U.S. EPA previously

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[1] Selenium is a metalloid, or metal-like substance; the discussion of metals in this chapter also applies to selenium unless otherwise specified.

[2] The dissolved fraction of a metal is operationally defined as that portion of the metal concentration that will pass through a 0.45 micrometer (µm) or 0.40 µm membrane filter (U.S. EPA 1996).

The acid-soluble fraction of a metal is that portion of the metal concentration that will pass through a 0.45 µm membrane filter after the solution to be filtered has been adjusted to within a pH of 1.75 ± 0.1 and held for a period of 16 hours (U.S. EPA 1991).

The total recoverable fraction of a metal is that portion of the metal concentration that is recoverable for purposes of analytical measurement.

The total fraction of a metal consists of the total concentration of the metal regardless of compartment (i.e., dissolved in the water, or adsorbed to food items, suspended particles, or sediment).

In an aquatic environment, where the environment may include water, sediment, suspended particles, and food items, the chemically relevant distinction is between the forms of metal that are dissolved and particulate, whereas the toxicologically relevant distinction is between the forms of metal that are toxic and nontoxic. (Particulate metal is operationally defined as total recoverable metal minus dissolved metal.) Even at that, a part of what is measured as dissolved is particulate metal that is small enough to pass through the filter, or is adsorbed to or complexed with organic colloids and ligands. A central issue in establishing and implementing metals criteria is how to accurately determine the fraction of total metal that is biologically available.

[3] This regulation exists because chemical differences between the effluent discharge and the receiving water body are expected to result in changes in the partitioning between dissolved and adsorbed (particulate) form of metal (U.S. EPA 1996).

[4] The CTR will promulgate dissolved acute fresh water criteria for arsenic, cadmium, chromium (III), chromium (VI), copper, lead, mercury, nickel, silver, and zinc; dissolved chronic fresh water criteria for arsenic, cadmium, chromium (III), chromium (VI), copper, lead, nickel, and zinc; dissolved acute salt water criteria for arsenic, cadmium, chromium (VI), copper, lead, mercury, nickel, selenium, silver, and zinc; and dissolved chronic salt water criteria for arsenic, cadmium, chromium (VI), copper, lead, mercury, nickel, selenium, and zinc.

concluded that the dissolved fraction is a better representation of the biologically active portion of the metal than is the total or total recoverable fraction (U.S. EPA 1993, 1996).[5]

Because U.S. EPA's CWA Section 304(a) aquatic life criteria for metals are expressed as total recoverable, these criteria were multiplied by a conversion factor[6] to derive dissolved criteria for the CTR. The conversion factors that the U.S. EPA generated and used to derive the dissolved CTR metals criteria are presented in Table V-6.

While the *conversion factor* (described above) is used to convert a total recoverable criterion to a dissolved criterion, the *translator* (described below) is used to translate the dissolved criterion to a total recoverable effluent limitation. The "translation" of a dissolved criterion to a total recoverable effluent limitation is simply an additional calculation that is performed

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5 When the aquatic life criteria documents for metals and selenium were first released, the U.S. EPA recommended determining compliance with the criteria by measuring the acid-soluble fraction. As no approved analytical method existed to measure this fraction, compliance was determined by measuring the total recoverable metal fraction. However, on October 1, 1993, the U.S. EPA published a memorandum offering technical guidance on interpretation and implementation of aquatic life metals criteria. In that memorandum, the U.S. EPA Office of Water reversed its support of determining compliance with metals criteria by measuring the total recoverable fraction in favor of using the dissolved metal fraction. The memorandum reads, "It is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bioavailable metal in the water column than does total recoverable metal." This memorandum further states that many in the scientific community feel that total recoverable measurements in ambient water have some value, and exceedances of aquatic life water quality criteria based on total recoverable measurements are an indication that metal loadings could be a stress to the ecosystem, particularly in compartments other than the water column (e.g., sediments). Therefore, until the scientific uncertainties are better resolved, a range of different risk management decisions can be justified. Thus, U.S. EPA concluded that the fraction to be regulated is best left to the state risk manager (U.S. EPA 1993). The effect of this policy on the NTR is described in the Federal Register Vol. 60, No. 86, pp. 22228-22237 and in amendments to 40 CFR 131.36.

The Chemical-Specific Objectives Task Force discussed the appropriateness of applying dissolved versus total recoverable metals criteria. The recommendations made in this regard will be considered in Phase 2 of the ISWP/EBEP when criteria to be considered for State-adopted water quality objectives will be developed.

6 In the original toxicity tests used by U.S. EPA to develop metals criteria for aquatic life, the metal in the test solutions was present in dissolved and particulate forms. Metal concentrations for these tests, however, were reported as total recoverable. When the U.S. EPA changed its policy to support dissolved metals criteria, the agency repeated some of the original tests, and simulated test conditions for others, for the purpose of determining the percent of total recoverable metal that was present in the dissolved form. Conversion factors were then generated which allowed for the conversion of the total recoverable criteria into dissolved criteria (Table V-6). These conversion factors, which are essentially predications of how the criteria would be different if they had been based on measured dissolved concentration in the toxicity tests used to derive the criteria, result in lowering the criteria concentrations.

TABLE V-6. Conversion Factors for Metals and Selenium

	FRESHWATER		SALTWATER
CHEMICAL	ACUTE	CHRONIC	ACUTE**
Arsenic	1.000	1.000	1.000
Cadmium*	0.944	0.909	0.944
Chromium (III)	0.316	0.860	N/A
Chromium (VI)	0.982	0.962	0.993
Copper	0.960	0.960	0.83
Lead*	0.791	0.791	0.951
Mercury	0.85	N/A	0.85
Nickel	0.998	0.997	0.990
Selenium	N/A	N/A	0.998
Silver	0.85	N/A	0.85
Zinc	0.978	0.986	0.946

Notes:

N/A = not available

* = Conversion factors for freshwater cadmium and lead are hardness-dependent. The values shown are with a hardness of 100 mg/L as calcium carbonate. The equations are as follows:

cadmium (acute): 1.136672 - [ln (hardness)(0.041838)],
cadmium (chronic): 1.101672 - [ln (hardness)(0.041838)], and
lead (acute and chronic): 1.46203 - [ln (hardness)(0.145712)].

** = U.S. EPA applied the saltwater acute conversion factors for the saltwater chronic criteria because (a) saltwater chronic conversion factors are not available, and (b) it is expected that the close similarities between the freshwater acute and chronic conversion factors would also be found (if the chronic value could be calculated) for the saltwater water conversion factors.

[Sources for Table 1: U.S. EPA (1996); Federal Register, Vol. 60, No. 86, p. 22231] to answer the question of what fraction of metal in the effluent will be dissolved in the receiving water body (as opposed to the fraction of metal that is bound to particulates and is, presumably, biologically unavailable). The chemical properties[7] of the mixture of effluent and receiving water will determine the fraction of the metal that is dissolved and the fraction that is in particulate form. The translator itself is the fraction of total recoverable metal in the receiving water that is dissolved. Thus, a total recoverable metal value that is used in the calculation of effluent limitations (see Chapter 1.2) is derived by dividing the dissolved criterion by the translator.[8]

Translators can be determined in several ways. U.S. EPA guidance (U.S. EPA 1996) identifies the following approaches to developing translators for metals or selenium:

(1) A translator equal to 1;
(2) A translator equal to the conversion factor, if a conversion factor was used to derive the dissolved criterion;
(3) A translator determined directly by site-specific measurements of dissolved and total recoverable metal concentrations in water samples of well-mixed effluent and receiving water (at or below the edge of an allowed mixing zone; see Chapter 1.2.2);
(4) A translator developed by determining the partition coefficient (K_p)[9] and then calculating the dissolved metal fraction based on the relationship between the particulate and dissolved metals concentrations at equilibrium;
(5) A translator based on old data/STORET data; and
(6) Other defensible approaches.

Approach (1) would apply the dissolved criterion directly in the calculation of a total recoverable effluent limitation. In Approach (2), the dissolved criterion that was derived by multiplying the total recoverable criterion by the conversion factor (Table V-6) would then be divided by the same conversion factor (i.e., the effluent limitation would be based on the total recoverable criterion that was converted to a dissolved criterion). The use of a translator equal to the conversion factor is also conservative and can result in a very stringent permit limit. Approach (3), which is favored by the U.S. EPA, involves analyzing the mixture of effluent and receiving water to determine the dissolved and total recoverable metal fractions.

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7 Many factors affect the dissolved to total recoverable metal ratio, including water temperature, pH, hardness, and the prevalence of binding sites such as total suspended solids, particulate and dissolved organic carbon (U.S. EPA 1996).

8 While the U.S. EPA recommends that translators be used to derive total recoverable effluent limitations for metals from dissolved criteria, the agency also notes that translators are not designed to consider bioaccumulation of metals (U.S. EPA 1996).

9 The partition coefficient (K_p) expresses the equilibrium relationship between the distribution (partitioning) of a metal between the dissolved and adsorbed (particulate) forms. The partition coefficient equals the slope of the data of particulate metal (µg/mg) against dissolved metal (µg/L) (U.S. EPA 1996).

The ratio of these fractions would then be used to translate from the dissolved concentration in the downstream receiving water to the total recoverable concentration in the effluent (i.e., the effluent limitation) that will not exceed the criterion. This approach will likely give the best estimate of the actual in-stream dissolved to solids ratio, though, in many cases, data are not readily available to define the relationship. Approach (4), using a partition coefficient, can, in some cases, result in a limit that is too stringent or not stringent enough. Approach (5), deriving translators based on old data and/or STORET data, is problematic as there has been general recognition that using these data may not generate appropriate translators due to contaminated metals data and other factors; the U.S. EPA recommends that this approach be phased out unless other data establish their validity for the sites in question. As a general rule, the U.S. EPA recommends that site-specific data be generated to develop site-specific translators (U.S. EPA 1993, 1996).

The Permitting and Compliance Issues Task Force recommended that, when developing total recoverable effluent limitations based on dissolved metal objectives, "A translator of 1:1 is to be utilized unless the discharger commits to developing a defensible translator of less than 1:1." The task force further recommend that, where there are multiple discharges of a problematic metal to a water body, the dischargers should "jointly establish a defensible translator on a watershed basis". A "defensible translator" is one developed using any of the U.S. EPA recommended procedures. In addition, the task force recommended that the RWQCB allow up to two years (see Chapter 2.1) after the reasonable potential determination (see Chapter 1.1) to establish translators. The task force recommendations that involve the procedural aspects of developing a translator are discussed in Chapter 6.

While the Chemical-Specific Objectives Task Force focussed on the relative advantages and disadvantages of dissolved versus total recoverable metal criteria (which will be considered in Phase 2 of the ISWP/EBEP), the topic of dissolved to total recoverable translators was also addressed. Although there was disagreement over the costs of developing translators, it was agreed that the expense should be borne by dischargers, at their option.

III. ALTERNATIVES FOR SWRCB ACTION

Alternative 1. <u>No action</u>. Under this alternative, the RWQCBs would decide how to translate dissolved metals criteria into total recoverable effluent limitations. This alternative would not address concerns regarding the inconsistent application of objectives among the RWQCBs.

Alternative 2. <u>Require a translator equal to 1, unless the discharger(s) commit to developing a defensible translator through a translator study</u>. Under this alternative, the dissolved criterion would be used directly to calculate a total recoverable effluent limitation if a translator study is not planned and completed. If the study is not done, this alternative may result in overly stringent effluent limitations because site-specific metal partitioning conditions would not be considered. The use of a 1:1 translator, combined with a provision that allows the discharger(s) to develop a defensible translator specific to the discharge location, would be simple to implement as it does not require each RWQCB to develop its own policy on translators, and it places the burden of developing translators on the discharger. This alternative reflects the recommendation of the Permitting and Compliance Issues Task Force.

Alternative 3. Require a translator equal to the conversion factor, unless the discharger(s) commit to developing a defensible translator through a translator study. Under this alternative, an effluent limitation based on a dissolved metal criterion would be equally or more stringent that an effluent limitation based on a total recoverable metal criterion if a translator study is not done. Therefore, like Alternative 2, this alternative would be protective, but may result in overly stringent effluent limitations if the translator study is not completed.

IV. STAFF RECOMMENDATION

Adopt Alternative 2.

CHAPTER 1.2.2 MIXING ZONES AND DILUTION CREDITS

I. PRESENT STATE POLICY

Currently, there is no statewide policy on mixing zones or dilution credits for discharges to the inland surface waters, enclosed bays, or estuaries of California. The Ocean Plan includes a provision for allowing a dilution credit for discharges to ocean waters. Four of the nine RWQCBs have provisions for mixing zones in their basin plans. These provisions are briefly described below.

II. ISSUE DESCRIPTION

Complying with water quality standards, and effluent limitations based on such standards, may be difficult for some dischargers. Regulatory relief for discharges may be provided, under certain conditions, by allowing limited dilution of the discharged effluent with the receiving water to occur before attainment with water quality criteria/objectives is required. The defined, physical area in the receiving water that is allocated for mixing and dilution of the discharged effluent is called a mixing zone.[1] Water quality criteria/objectives must be met throughout a water body except within any allowed mixing zone.[2]

Mixing zones are expressed in dimensions of size and shape, such as the zone of initial dilution (defined in Appendix B), distance from outfall, or percent of volume, width, length, or surface or cross-sectional area of the receiving water. Mixing zones that are allocated to a discharge are considered both in calculating water quality-based effluent limitations and in determining compliance with water quality standards in the receiving water body. If a mixing zone is allowed, a water quality-based effluent limitation greater than the criterion/objective may be established. If a mixing zone is not allowed, the effluent limitation is set equal to the criterion/objective.

Logically, mixing zones can be applied only where an identifiable, discrete point of discharge exists and where the discharge is regulated through NPDES permits and other waste discharge requirements (WDR) issued by the SWRCB and RWQCBs. In all cases, mixing zones must be applied or denied as necessary to protect the beneficial uses and integrity of the receiving water body.

A mixing zone corresponds to a dilution credit, D, that may be used to calculate effluent limitations (described in Chapter 1.2) for a discharge (i.e., the mixing zone granted to a discharge determines the dilution credit, and vice versa).[3] Before establishing a mixing zone and dilution credit for a discharge, it must first be determined if, and how much (if any), receiving water is available to dilute the discharge. For a discharge that mixes rapidly and completely[4] in the receiving water, this is accomplished by calculating a dilution ratio (i.e., the upstream receiving water flow, $Q_{u,}$ divided by the discharged effluent flow, Q_e) from which the dilution credit is derived. Thus, the dilution ratio is expressed as Q_u/Q_e. This value represents the maximum dilution credit that is physically available and that may be granted. The dilution ratio flows may be determined as follows:

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[1] Under CWA regulations (40 CFR 131.13), states can adopt policies, such as those for mixing zones, that generally affect the application and implementation of water quality standards. Such policies are subject to U.S. EPA review and approval. If an appropriate authorizing policy is included in the state's water quality standards, the state may designate a mixing zone.

[2] Occasionally, the phrase "point of application" is used when referring to mixing zones. "Point of application" refers to the place where water quality standards (i.e., criteria or objectives) apply for purposes of determining compliance. If a mixing zone is allowed, the "point of application" of criteria/objectives is at the edge of an allowed mixing zone; if a mixing zone is not allowed, the "point of application" is at the "end-of-pipe".

[3] Detailed information on the application of mixing zones and dilution credits in the calculation of effluent limitations is presented in the TSD (U.S. EPA 1991) and the Water Quality Standards Handbook (U.S. EPA 1994).

[4] The U.S. EPA (1991) defines a completely mixed condition as no measurable difference in the concentration of a pollutant across a transect of the water body (e.g., does not vary by 5 percent).

- The receiving water flow (Q_u) should be based on the critical low flow of the receiving water because the priority pollutant criteria are established to protect uses at or above critical low flow conditions (i.e., these flows approximate a worst case condition) (U.S. EPA 1991). The U.S EPA (1991, 1994) identifies two methods for calculating acceptable critical low flows: (1) the hydrologically-based method developed by the U.S. Geological Survey; and (2) the biologically-based method developed by the U.S. EPA. The hydrologically-based method (which has been used traditionally) establishes critical low flows of 1Q10, 7Q10, 30Q5, and harmonic mean (each defined in Appendix B) that correspond to acute aquatic life criteria, chronic aquatic life criteria, human health criteria for carcinogens, and human health criteria for noncarcinogens, respectively. The biologically-based critical flow method (which is calculated using U.S. EPA's DFLOW computer model) requires more data than the hydrologic method but considers specific toxicological effects of a pollutant and biological recovery times in determining the flow.[5]

- The effluent flow (Q_e) could be based on the facility's design flow, or the facility's maximum or mean flows over a specified period of time (e.g., maximum daily mean flow, mean daily mean flow). The selection of the effluent flow is based on a consideration of worst case conditions and the type of criterion.

Depending on the conditions and characteristics of the receiving water and the effluent, the appropriate dilution credit will be less than or equal to the dilution ratio. Therefore, factors in addition to the dilution ratio need to be considered in determining the portion of the critical low flow to provide as dilution, if any.

The U.S. EPA (1991, 1994) has identified physical, chemical, and biological factors that may constitute a basis for limiting or denying a mixing zone (based on a calculated dilution credit). These factors include, but are not limited to: size, depth, configuration, and flow/current patterns of the receiving water; size, depth, and configuration of the discharge outfall; relative densities of the effluent and receiving water; mixing areas that restrict passage of, or that are attractive to (e.g., elevated temperatures), aquatic life; the presence of bioaccumulative, persistent, carcinogenic, mutagenic, or teratogenic pollutants (each defined in Appendix A) in the effluent; the presence of drinking water intakes, recreational areas, biologically important areas, or sensitive habitats; and the potential for multiple or overlapping mixing zones. In addition, the U.S. EPA (1991, 1994) recommends that mixing zones be free from the following:

- Materials in concentrations that will cause acutely toxic conditions to aquatic life;
- Materials in concentrations that settle to form objectionable deposits;

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[5] The biologically-based flow method considers the durations and frequencies of the criteria; therefore, it provides that criteria excursions do not exceed the maximum allowed (i.e., once every 3 years). In contrast, the use of 1Q10 and 7Q10, which do not consider the duration and frequency of a criterion, may result in more or fewer excursions that once in 3 years (U.S. EPA 1991).

- Floating debris, oil, scum, and other matter in concentrations that form nuisances;
- Substances in concentrations that produce objectionable color, odor, taste, and turbidity; and
- Substances in concentrations that produce undesirable aquatic life or result in a dominance of nuisance species.

Based on these considerations, mixing zones and dilution credits may be limited or denied for an entire discharge, or on a pollutant-by-pollutant basis.

The U.S. EPA (1991) recommends that, for incompletely-mixed discharges, a mixing zone analysis would be needed to determine if dilution is available, and if a mixing zone and dilution credit are appropriate. Such mixing zone studies include, but are not limited to: tracer studies, dye studies, modelling studies, and monitoring upstream and downstream of the discharge that characterizes the extent of actual dilution. (The procedures outlined in Section VI of this FED are relevant to the process that may be followed in conducting a mixing zone study.) It is important to do mixing zone studies for discharges that do not mix rapidly and completely because they have the potential to create conditions (e.g., shore-hugging plumes) that result in prolonged exposures of aquatic life and, to a lesser extent, humans to levels of pollutants that do not meet water quality standards.

The rescinded ISWP/EBEP included narrative restrictions and requirements for granting mixing zones, described general mixing zone conditions, maximum spatial mixing zone dimensions for lakes, reservoirs, rivers, and streams, and requirements that either a zone of initial dilution or maximum dilution credit be established for enclosed bays.

Four of the nine RWQCBs currently have mixing zone provisions in their basin plans. The basin plans for three of those RWQCBs (Central Valley, Los Angeles, and San Diego) have general provisions for allowing mixing zones on a case-by-case basis. The San Francisco Bay Basin Plan allows a dilution ratio of 10:1 for deepwater outfalls and zero for shallow water outfalls, and allows for exceptions to the mixing zone provisions under certain conditions.

The Los Angeles Basin Plan states that the RWQCB can allow a mixing zone for compliance with receiving water objectives on a case-by-case basis. The basin plan further states that an approved mixing zones for rivers and streams can not extend more than 250 feet from the point of discharge or be located less than 500 feet from an adjacent mixing zone (however, the basin plan notes that mixing zones are not appropriate for many of the streams in the region due to minimal upstream flows. For lakes and reservoirs, the basin plan states that a mixing zone may not extend 25 feet in any direction from the discharge point, and the sum of mixing zones in these waters may not be more that 5 percent of the volume of the water body. These spatial mixing zone dimensions are consistent with those of the rescinded ISWP/EBEP.

The Central Valley Basin Plan states that the RWQCB may designate mixing zones in permits provided the discharger has demonstrated to the satisfaction of the RWQCB that the mixing zone will not adversely impact beneficial uses. The basin plan further states that the RWQCB, in determining the size of mixing zones, will consider the applicable procedures and guidelines in U.S. EPA guidance (i.e., U.S. EPA 1991, 1994). The basin plan also states that mixing zones for acute aquatic life criteria will generally be limited to a small zone of initial dilution[6], pursuant to U.S. EPA guidelines.

The San Diego Basin Plan states that the RWQCB will consider the establishment of mixing zones for inland surface waters, enclosed bays, and estuaries on a case-by-case basis, and that the criteria to be established for mixing zones will be specified in the WDR for the discharge.

The Ocean Plan provides that a minimum probable initial dilution[7] (expressed as parts seawater to part wastewater) be used in the calculation of an effluent limitation, based on observed waste flow characteristics, observed receiving water density structure, and the assumption that no currents (of sufficient strength to influence the initial dilution process) flow across the discharge structure.

The Permitting and Compliance Issues Task Force discussed the issue of mixing zones and concluded that a statewide policy on mixing zones was needed. Specifically, the task force recommended that the SWRCB: (1) establish the situations in which mixing zones may be authorized or denied: (2) establish the specific methods, guidelines, and technically-defensible approaches to be followed in determining mixing zone boundaries and restrictions, and the actual dilution that is received within a designated mixing zone, based on mathematical predictions and scientifically-defensible field studies; (3) to the extent appropriate, specify a particular mixing zone approach to promote consistency; (4) clearly set forth the considerations, guidelines, and default assumptions to be used in making case-by-case decisions (e.g., critical design periods for effluent discharges and receiving water bodies); (5) be sufficiently detailed to ensure consistency in the derivation of water quality-based effluent limitations in point source discharge permits; (6) establish mixing zone characteristics or "in-zone" quality requirements; (7) consider how the mixing zone policy might apply to nonpoint source and storm water discharges; (8) require dischargers to coordinate with the RWQCB in the design and implementation of mixing zone studies; (9) allow mixing zones for acute and chronic chemical-specific criteria/objectives, and for chronic toxicity objectives; and (10) specify whether a mixing zone is or is not allowed for acute toxicity. The Toxicity Task

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[6] U.S. EPA (1991) describes initial dilution as the first stage of mixing that is determined by the initial momentum and buoyancy of the discharge. This initial contact with the water is where the concentration of effluent is greatest in the receiving water. The second stage of mixing covers a more extensive area in which the effect of initial momentum and buoyancy is diminished and the waste is mixed primarily by ambient turbulence.

[7] The Ocean Plan defines initial dilution as the process which results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge. The plan further describes initial dilution specific to submerged buoyant discharges (characteristic of most municipal and industrial waste) and to shallow water, surface, and nonbuoyant discharges (characteristic of cooling water wastes and some individual discharges) (SWRCB 1997).

Force also addressed the issue of mixing zones for acute toxicity objectives. While both task forces agreed that mixing zones should be allowed for acute and chronic chemical-specific criteria/objectives, and for chronic toxicity, they were divided on whether mixing zones should be allowed for acute toxicity. Because the proposed Policy does not address acute toxicity objectives, mixing zones for acute toxicity are not considered here.

The alternatives presented below were developed with a consideration of current mixing zone provisions in basin plans and the Ocean Plan, and the recommendations of the task forces. These alternatives address mixing zone issues in a fairly general manner. The SWRCB will consider developing specific technical guidance on mixing zones at a later date.

III. ALTERNATIVES FOR SWRCB ACTION

Alternative 1. No action. Under this alternative, the RWQCBs that have provisions for mixing zones or dilution credits in their basin plans would continue to implement them accordingly. The RWQCBs that do not have provisions for mixing zones could not allow dilution credits unless a mixing zone policy were adopted in their basin plans. The statewide inconsistency in addressing mixing zones would persist.

Alternative 2. Establish a policy to prohibit mixing zones for priority pollutant criteria/objectives and the proposed statewide chronic toxicity objective. Under this alternative, the applicable priority pollutant criteria/objectives and statewide chronic toxicity objective would have to be met at the end-of-pipe. This approach would be most protective of water quality and beneficial uses because limited impact areas where water quality standards are not met would be prohibited; however, this alternative would eliminate RWQCB flexibility to determine if a mixing zone is appropriate for a given situation.

Alternative 3. Establish a general statewide policy to allow mixing zones for priority pollutant criteria/objectives and the proposed statewide chronic toxicity objective under certain conditions. Under this alternative, all of the RWQCBs, including those that currently do not have mixing zone provisions in their basin plans, would have the option of considering whether to grant or deny a mixing zone for priority pollutants and chronic toxicity case-by-case. Thus, the RWQCBs would consider whether it is appropriate to allow a mixing zone, which would assist dischargers in meeting water quality-based effluent limitations. Although granting a mixing zone creates a limited impact area where water quality standards need not be met, provisions for when to deny mixing zones and appropriate restrictions for granting mixing zones, ensure that beneficial uses are protected and the overall integrity of the water body is not compromised. Therefore, under this alternative, the general physical, chemical, and biological characteristics to be provided, and conditions to be prevented, in considering the allowance of mixing zones would be described. These factors would be considered by the RWQCB, in addition to calculation of dilution credits.

Alternative 4. Establish detailed technical mixing zone guidance. Under this alternative, explicit guidance on establishing mixing zones, deriving dilution credits, and conducting mixing zone studies would be developed for use by dischargers and the RWQCBs in issuing permit requirements. Due to the variability of discharge and receiving water situations in the State, extensive resources and expertise would be required to develop meaningful mixing zone guidance; therefore, this alternative is most appropriately deferred at this time.

IV. STAFF RECOMMENDATION

Adopt Alternative 3.

CHAPTER 1.2.3 AMBIENT BACKGROUND CONCENTRATIONS

I. PRESENT STATE POLICY

Currently, there is no statewide law or policy applicable to inland surface waters, enclosed bays, or estuaries that defines ambient background concentration of pollutants or specifies how it should be determined. The definition and determination of ambient background concentrations for these waters are currently deferred to the RWQCBs. The San Francisco Bay RWQCB has estimated salt water and fresh water background concentrations for seven metals. These background concentrations, listed in the San Francisco Bay Basin Plan, were calculated as averages of observed concentrations. The remaining eight RWQCBs do not specify in their basin plans background concentrations or how they are to be estimated. The Ocean Plan has established numeric values for background seawater concentrations for five metals; background concentrations for all other parameters have been set equal to zero.

II. ISSUE DESCRIPTION

The ambient background concentration of pollutants is a variable in the mass balance equation often used when calculating effluent limitations (see Chapter 1.2). An estimate of the background concentration is usually necessary when mixing zones are allowed, in order to ensure that water quality criteria or objectives are met outside the mixing zone. The ambient background concentration can be characterized as the water column concentration of a substance in the receiving water at the outfall point, had the discharge not been present. Ambient water quality measurements are often taken immediately upstream or near the discharge, where measurements are not influenced by the discharge. The background concentration assists in determining how much dilution of the pollutant is possible in the receiving water without causing an excursion (defined in Appendix B) above the water quality criteria or objectives. The higher the background concentration, the less dilution is possible. The mass balance equation may be used as a simple, steady-state equation or as part of a dynamic model. If an effluent limitation is derived using a steady-state equation, a single background concentration that represents the available receiving water data must be determined. If a dynamic model is used to derive an effluent limitation, receiving water data can often be used directly. Receiving water data generally consist of measurements of ambient water column concentrations; however, ambient concentrations can also be modeled based on loading and flow information or fish tissue data. Receiving water data are often variable. Pollutant concentrations in the receiving water body may fluctuate seasonally, or in response to storms, human activity, and other factors. Estimating the background concentration can be further complicated by limited data, difficulty with analyzing data below detection or quantification limits, data from varying analytical methods, etc. Background concentrations can be calculated for each pollutant on a discharge-by-discharge or water body-by-water body basis.

To ensure that the water quality criterion or objective is met in the receiving water body, the units of the individual segments of the mass balance equation, ideally, should be identical. The averaging periods of the background concentration, the water quality criterion/objective, and the effluent limitation should, thus, be identical; in reality, however, they are often different. Measured ambient water concentrations, used for calculating the background concentration, are often instantaneous "grab" samples. The CTR criteria are expressed as 1-hour averages and/or 4-day averages for protection of aquatic life and 30-day averages for protection of human health. Federal regulations (40 CFR 122.45(d)) generally require that water quality-based effluent limitations be expressed as maximum daily, average weekly, or average monthly limitations (defined in Appendix B).

The method and accuracy with which the ambient background concentration is characterized are important because the background concentration influences whether an effluent limitation is needed for a discharge (see Chapter 1.1), the value of the effluent limitation (see Chapter 1.2), special provisions for intake water pollutants (see Chapter 1.2.4), and other permitting decisions.

Various regulatory approaches for defining and estimating ambient background concentrations exist. The rescinded ISWP/EBEP defined the background concentration as ". . . the median concentration of a substance, in the vicinity of the discharge, which is not influenced by the discharge. Ambient concentrations shall be determined using analytical methods at least as sensitive as those used to determine compliance with effluent limitations". The numerical background concentrations listed in the Ocean Plan apply to all ocean discharges. The San Francisco Bay Basin Plan contains different numerical background concentrations for salt water and fresh water. The Ocean Plan and the San Francisco Bay Basin Plan, thus, allow background concentrations to be applied on a water body-by-water body basis. Using a water body-by-water body approach is less accurate than using a discharge-by-discharge approach, but the RWQCB need only estimate a background concentration once for all the discharges to the water body.

The Great Lakes Initiative (GLI) (U.S. EPA 1995) defines "background" as ". . . all loadings that (1) flow from upstream waters into the specified watershed, water body or water body segment. . .; (2) enter the specified watershed, water body or water body segment through atmospheric deposition or sediment release or resuspension; or (3) occur within the watershed, water body or water body segment as a result of chemical reactions." The GLI specifies that the background concentration be established "on a case-by-case basis as the geometric mean (defined in Appendix B) of (i) acceptable available water column data; or (ii) water column concentrations estimated through the use of acceptable available caged or resident fish tissue data; or (iii) water column concentrations estimated through use of acceptable available or projected pollutant loading data." The GLI further recommends that best professional judgement[1] be used for selecting data to characterize the background concentration and for evaluating data with values above and below the detection level. If all available and acceptable data are below the detection level, then the GLI stipulates that the data be assumed to be zero when calculating the background concentration (U.S. EPA 1995).

The Technical Support Document for Water Quality-Based Toxics Control (TSD) (U.S. EPA 1991) recommends using worst-case conditions of flow and pollutants if a steady-state equation is used for establishing effluent limitations. This document does not specify how background concentration is to be determined.

The Permitting and Compliance Issues Task Force addressed the issue of background concentration but did not suggest a method to use when calculating the background concentration. Rather, the task force recommended that the background concentration reflect the allowable frequency of exceedance (defined in Appendix B) and the averaging period of the criterion or objective. The task force also recommended that acceptable statistical techniques be utilized to estimate ambient background levels when a portion of the measured levels are below the practical quantitation limit (see Chapter 2.3).

The following alternatives and the supplemental option have been developed partly based on the regulatory approaches described above. The emphasis is on alternative methods for calculating ambient background concentration, rather than on alternative definitions of background concentration or on alternative ways of analyzing data below detection. The main features of the alternatives are shown in Table V-7. ***[To access Table 7, go to the "Table of Contents" and click on "List of Tables".]***

For all of the following alternatives, a maximum value was selected for samples below detection because the TSD recommends assuming worst-case conditions when using a steady-state equation to establish effluent limitations. If a substance was not detected in a sample, the value for that sample would, therefore, be set equal to the detection limit for the pollutant in that sample before calculating the background concentration. All available applicable data (as decided by the RWQCBs) should be included when calculating a background concentration. Further discussion of the use of data below detection can be found in Chapter 2.3. All of the methods could be used on a pollutant-by-pollutant and discharge-by-discharge basis or on a water body-by-water body basis.

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[1] Best professional judgement means the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data and information that forms the basis for the terms and conditions of an NPDES permit (U.S. EPA 1993). Best professional judgement, as used in this context, should be distinguished from the use of best professional judgement to develop technology-based effluent limitations in cases where an applicable effluent guideline has not yet been promulgated for an industry (see 40 CFR 125.3).

III. ALTERNATIVES FOR SWRCB ACTION

Alternative 1. No action. The RWQCBs would decide how background concentrations are to be determined. This would allow RWQCBs the flexibility to tailor a method to a specific region; however, this approach would not foster statewide consistency.

Alternative 2. Calculate the background concentration as the arithmetic mean of observed ambient water concentrations. The definition and calculation of the arithmetic mean is described in detail in Appendix B. Briefly stated, the measured ambient water concentrations are first added, then divided by the number of samples. Calculators and software programs will readily calculate the arithmetic mean.

This alternative, which is the approach taken by the San Francisco Bay RWQCB, would be easy for permit writers to use when estimating background concentrations and can be used with very little data, but it does have some serious flaws. The arithmetic mean is a good measure of the central point of the data when the data are normally distributed (i.e., evenly spread around the central point), but not if the data are skewed (unevenly spread) as most ambient water measurements tend to be (U.S. EPA 1991). Water quality measurements often exhibit a noticeable skewness to the right when graphed, partially due to concentrations being restrained at some lower limit and theoretically unrestrained at the upper range. The arithmetic mean is, therefore, likely to overestimate the central location of the data, even for large data sets. However, due to statistical laws, arithmetic means themselves tend to be normally distributed. Therefore, if weekly (or monthly) averages of measurements are calculated and graphed, they will tend to be evenly spread. The arithmetic mean of these weekly (or monthly) averages is likely to be a good measure of the central location of the measured values. Calculating averages of averages requires a large data set and the use of this particular technique is, therefore, limited.

Additionally, the arithmetic mean does not compensate for the variability of the data, so a few outliers may greatly affect the arithmetic mean (although this problem decreases as sample size increases). This alternative also does not account for uncertainty related to the number of samples. As the sample size decreases, the probability increases that the calculated average background concentration will not represent the actual average background concentration in the receiving water. Therefore, as the sample size decreases, it becomes less likely that the effluent limitations are set appropriately. Effluent limitations may be set more stringent than necessary or, conversely, effluent limitations may not be stringent enough, which may result in excursions above the water quality criterion or objective in the receiving water.

Another drawback to using the arithmetic mean to calculate background concentration is that the arithmetic mean estimates a central value rather than a worst-case value, as is recommended by the TSD (U.S. EPA 1991) when using a steady-state equation to estimate effluent limitations. By definition, since approximately half of the measured ambient concentrations would be *higher* than the arithmetic mean, the water quality criteria/objectives in the receiving water would be exceeded half the time if the arithmetic mean was used as background concentration. This may be acceptable when complying with weekly or monthly average effluent limitations if daily samples are available to calculate the weekly or monthly averages. Even so, it is very likely that excursions above the criteria or objectives would occur due to seasonal or other variability in the ambient water quality, or due to uncertainty inherent when using the arithmetic mean to estimate the background concentration. When complying with daily maximum effluent limitations derived under this alternative, it is almost certain that excursions above the criteria or objectives would occur if effluent and flow conditions were at critical levels.

Note also that both the criterion/objective and the effluent limitation are maximum limits for averages or maxima of measured data. If consistency between the criterion/objective and the effluent limitation is desired, a maximum value would be a better choice than a mean value for calculation of background concentration.

In conclusion, this method would be extremely simple to apply, but the likelihood of excursions above the water quality criterion or objective in the receiving water would be high as a result of too lenient effluent limitations. With small sample sizes, overly stringent effluent limitations would also be possible.

Alternative 3. <u>Calculate background concentration as the median of observed ambient water concentrations</u>. The definition and calculation of the median is described in Appendix B. Simply put, if the measured ambient water concentrations are arranged in numerical order, the median is the middle number. Half of all measurements are below the median and half are above the median. Many calculators and software programs will readily calculate the median. This alternative, which is the approach adopted in the rescinded ISWP/EBEP, would be easy for permit writers to use when estimating background concentration.

The median is a better method for calculating the central location of the data than the arithmetic mean (Alternative 2), because a few outlying data points have little effect. It is almost as easy to compute as the arithmetic mean, but also has many of the same serious disadvantages. Like the arithmetic mean, the median does not account for the uncertainty related to the number of samples. As the sample size decreases, it becomes more likely that the background concentration is not adequately characterized and the effluent limitation based on the background concentration is not set appropriately, leading to the possibility of excursions above the water quality criteria/objectives or, conversely, more stringent effluent limitations than necessary. Nor does the median match the averaging period of the criterion/objective or the effluent limitation. Half the ambient measurements would, by definition, be higher than the median, so the water quality criteria/objectives would be exceeded in the receiving water half the time, with a high probability of excursions above the criteria or objectives.

In summary, this method would be simple to apply, but would have a high probability of excursions above the water quality criteria or objectives occurring in the receiving water.

With small sample sizes, overly stringent effluent limitations would also be a possibility, although not as likely as for the arithmetic mean.

Alternative 4. Calculate background concentration as the geometric mean of observed ambient water concentrations. As discussed earlier, water quality measurements often exhibit a noticeable skewness to the right (toward higher values). Fortunately, the natural logarithms of these measurements are often normally distributed in a bell-shaped curve. The geometric mean is the exponential of the arithmetic mean value of the measured concentrations' natural logarithms. It can be calculated as described in Appendix B. Many calculators and software programs will readily calculate the geometric mean.

This alternative, which is consistent with the GLI approach, would be easy for permit writers to use when estimating background concentration. The geometric mean is a better method for calculating the central location of log-normally distributed data than the arithmetic mean, because skewness of the data is considered (for data skewed to the right, the geometric mean is lower than the arithmetic mean). It is almost as easy to compute as the arithmetic mean. However, like the arithmetic mean and the median, the geometric mean does not account for the uncertainty related to the number of samples. Therefore, if only a few data points exist, it is likely that the calculated geometric mean of the samples would either underestimate or overestimate the actual geometric mean concentration in the receiving water, possibly leading to overly stringent effluent limitations or, conversely, excursions above water quality criteria or objectives due to overly lenient effluent limitations. The geometric mean also does not match the averaging periods of the criteria/objectives or the effluent limitations. Furthermore, the geometric mean is a measure of central tendency rather than an estimate of worst case conditions, thus, carrying with it a high probability of excursions above the water quality criteria or objectives.

In conclusion, this method would be simple to apply, but the likelihood of excursions above the water quality criterion or objective in the receiving water would be high. With small sample sizes, overly stringent effluent limitations would also be possible.

Alternative 5. Set the background concentration equal to the maximum observed ambient water concentration. Under this alternative, the maximum value of measured ambient water concentrations would be chosen as the background concentration. Many software programs will automatically locate the maximum concentration in a database.

This method would be very easy for permit writers to use when estimating background concentrations. The TSD (U.S. EPA 1991) recommends using worst-case conditions of flow and pollutants if using a steady-state equation to establish effluent limitations in order to ensure that water quality criteria or objectives are met in the receiving water. The maximum observed background concentration arguably represents a worst-case condition, and is more protective of water quality than the arithmetic mean, the median, and the geometric mean because the probability of excursions above the water quality criterion or objective is much less. However, the maximum observed concentration also does not account for the uncertainty related to the number of samples. With a small data set it is likely that the background concentration is either underestimated, possibly leading to overly lenient effluent limitations and excursions above water quality criteria/objectives, or overestimated, possibly leading to overly stringent effluent limitations. Furthermore, the possibility of a laboratory or sampling anomaly influencing the maximum observed ambient concentration is high, which also could lead to overly stringent effluent limitations.

In conclusion, this method would be simple to apply, but may lead to overly stringent effluent limitations. With small sample sizes, excursions above water quality criteria or objectives would also be a possibility.

Alternative 6. Calculate the background concentration as the 99th percentile of observed ambient water concentrations. The 99th percentile is the concentration that 99 percent of the measured concentrations would fall below. It can be found by ranking the measured concentrations or can be estimated as described in Appendix B. Most spreadsheet programs will directly estimate the 99th percentile and calculators could also be used, although they are more cumbersome. This method can be used with little data.

This method has all the advantages of Alternative 5, but is more reliable at estimating the background concentration because high outliers would not have as much of an effect. Like the previous alternatives, this method does not account for uncertainty related to sample size. The smaller the sample size, the greater the probability of either underestimating or overestimating the background concentration. This alternative arguably represents a worst-case condition, as recommended by the TSD (U.S. EPA 1991). A 95th percentile, or other percentile, could be used instead of the 99th percentile.

Alternative 7. Calculate the background concentration as the upper 99 percent confidence level of the 99th percentile of observed ambient water concentrations. This method is the same as Alternative 6, except this alternative employs a statistical procedure to compensate for uncertainty related to sample size by projecting what the 99th percentile of the observed ambient concentrations would have been, had more measurements been available. The following method is based on statistical procedures that are described in detail in the TSD (U.S. EPA 1991):

1. The coefficient of variation (*CV*) is found for the ambient water data. For less than ten samples, *CV* may be set equal to 0.6, or a larger calculated number may be used.[2] For ten or more samples, *CV* should be calculated as the standard deviation (see Appendix B) divided by the arithmetic mean (see Appendix B) of the measured values. Most calculators and software programs will readily locate the mean and the estimated standard deviation.

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[2] Typical values for CV range from 0.2 to 1.2. A value of 0.6 is a relatively conservative estimate that may be used for CV when available data sets are small, and the uncertainty on the calculated standard deviation and arithmetic mean are therefore high (U.S. EPA 1991).

2. The uncertainty factor, associated with the computed *CV* and the number of data points, is found in Table V-8 (or may be calculated as described in Chapter 1.1). ***[To access Table V-8, go to the "Table of Contents" and click on "List of Tables".]***

3. The uncertainty factor is then multiplied by the maximum of the observed ambient water concentrations. The result is the projected background concentration.

This alternative requires approximately the same effort as Alternative 6, has the same advantages, and, furthermore, has a much lower probability of under-or over-estimating the actual, worst-case background concentration. However, as with the previous alternatives, the background concentration would not completely reflect the allowable frequency of exceedance and the averaging period of the criterion or objective. This alternative is more conservative than Alternative 8.

Alternative 8. Calculate the background concentration as the upper 95 percent confidence level of the 95th percentile of observed ambient water concentrations. This method is the same as Alternative 6, except for the percentages used. The uncertainty factor, associated with the computed *CV* and the number of data points, is found in Table V-9 (or may be calculated as described in Chapter 1.1). ***[To access Table V-9, go to the "Table of Contents" and click on "List of Tables".]*** This alternative is less conservative than Alternative 7 and will result in lower ambient background concentrations.

Option to Supplement Alternatives 2-8:

Option A. Calculate the background concentration to reflect the allowable exceedance frequency and averaging periods of the criteria or objectives. The Permitting and Compliance Issues Task Force recommended that the background concentration reflect the allowable frequency of exceedance and the averaging period of the applicable criterion or objective. The task force also recommended that the criteria or objectives be expressed as daily maxima, and monthly and weekly averages, to simplify the process of deriving effluent limitations. Background concentrations should then similarly be expressed as daily maxima and monthly and weekly averages. This could be partly accomplished by appropriately averaging the ambient water measurements before calculating the background concentration. For example, if the applicable criterion or objective is a 30-day average for protection of human health, the monthly averages (i.e., arithmetic mean is defined in Appendix B) of the measurements would be found first. The background concentration would then be calculated based on the computed monthly averages. If the applicable criterion or objective was a 4-day average criterion/objective for protection of aquatic life, weekly averages of the measurements would be found first. The background concentration would then be calculated based on the computed weekly averages. If the applicable criterion or objective was a 1-hour average criterion/objective for protection of aquatic life, the maximum daily value of the measurements would be found first. The background concentration would then be calculated based on the maximum daily values. This option is simple to implement, but adds an extra layer of calculation and may be confusing as more than one background concentration is calculated. It also requires that sufficient ambient data exist to calculate weekly or monthly averages, or daily maxima.

IV. STAFF RECOMMENDATION

Adopt Alternative 7.

CHAPTER 1.2.4 INTAKE WATER CREDITS

I. PRESENT STATE POLICY

Currently, no statewide law or policy exists that directly addresses credit for intake water pollutants when establishing water quality-based effluent limitations for discharges to inland surface waters, enclosed bays, or estuaries. The basin plans do not contain any special provisions for intake water pollutants. The Ocean Plan specifies that water quality-based effluent limitations will be calculated for the gross discharge, rather than the net discharge. For most ocean dischargers, effluent limitations consisting of concentration and mass emission limits are calculated using a steady-state mass balance equation which considers the criterion/objective, the initial dilution, and the background concentration. Within these restrictions, no allowance for intake water pollutants can be made (generally, so much dilution is available in the ocean that pollutants in the intake water are not a concern). However, the Ocean Plan also allows special procedures to be applied when calculating effluent limitations for power plant discharges, which allow credit for some intake water pollutants.

II. ISSUE DESCRIPTION

The only or primary source of a pollutant in a discharge may be the intake water for a facility. If a pollutant in the intake water exceeds (defined in Appendix B) water quality criteria/objectives and mixing of the discharge with the receiving water does not provide adequate dilution, the facility may need to undertake expensive removal processes, unless intake water pollutants are specifically considered when effluent limitations are established. Intake water pollutants are especially of concern in impaired water bodies and for industries that use large amounts of water for once-through cooling water flows, because of the difficulty of treating large volumes of water and the magnitude of impact.

Federal regulations (40 CFR 122.45(g)) currently allow *technology-based* effluent limitations to be adjusted to reflect credit for pollutants in the discharger’s intake water if certain conditions are met. The credit does not apply to all pollutants. The discharger must demonstrate that technology-based effluent limitations cannot be met due to the presence of intake water pollutants, despite properly installed and operated treatment systems. Generally, credit is granted only if the intake water is drawn from the same water body into which the discharge is made, but this requirement may be waived if no environmental degradation will result. Intake water credit may be granted only to the extent necessary to meet the applicable technology-based limitation, up to a maximum amount equal to the influent amount.

A similar Federal regulation does not exist for *water quality-based* effluent limitations (with the exception of the Great Lakes Initiative (GLI) described below (U.S. EPA 1995). The U.S. EPA (1995) has stated "that '[the] Clean Water Act's requirement to protect and enhance water quality is not conditioned on factors such as intake water quality and it would be inappropriate for EPA to impose such a condition. Eligibility for a net credit under [the technology-based] regulations does not imply any right to violate water quality standards.' (49 FR 37998, 38027, September 26, 1984)." The U.S. EPA also indicated, however, that permit writers may take the presence of intake water pollutants into account, as appropriate, in individual permitting decisions as long as "permit limits '...[are] adequate to meet the water quality objectives of the Clean Water Act when considered along with control requirements for other discharges to the stream.' (49 FR 38027, September 26, 1984)."

Regulatory mechanisms exist that directly or indirectly allow for consideration of intake water pollutants, but these mechanisms are not permit-based. These mechanisms include temporary variances or exceptions (see Chapter 5.6), site-specific objectives (see Chapter 5.4), Total Maximum Daily Loads (TMDLs) and watershed management (see Chapter 5.5), and removal of non-existing uses. TMDLs are U.S. EPA's preferred mechanism for bringing impaired waters into compliance with water quality criteria/objectives. For discharges to non-attained waters, where water quality criteria/objectives are not met and TMDLs have not yet been established to control pollutants, the U.S. EPA generally requires that effluent limitations be established to meet the criteria/objectives at the end-of-pipe (U.S. EPA 1995).

In the GLI (U.S. EPA 1995), the U.S. EPA authorized the Great Lakes States and Tribes to consider intake water pollutants on a pollutant-by-pollutant and discharge-by-discharge basis, both when determining if a discharge has the reasonable potential to cause or contribute to an excursion (defined in Appendix B) above a water quality criterion or objective (see Chapter 1.1) and when establishing effluent limitations. The GLI states that the permitting authority may find that water quality-based effluent limitations are not necessary for an intake water pollutant (see Chapter 1.1 for further discussion) if the permittee demonstrates that the following conditions are met: (1) the facility withdraws 100 percent of the intake water from the same body of water[3] into which the discharge is made, (2) the facility does not contribute any additional mass of the intake water pollutant to its wastewater, (3) the facility does not alter the intake pollutant chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream, (4) the facility does not increase the intake water pollutant concentration at the edge of a mixing zone or at the discharge point as compared to the pollutant concentration in the intake water,

[3] The GLI considers an intake water pollutant to be from the same body of water as the discharge if the intake water pollutant would have reached the discharge point in the receiving water within a reasonable period had it not been withdrawn. The permittee must demonstrate that the receiving water quality is similar to the intake water quality, especially with respect to the problem pollutant, and that the intake and the discharge points are directly hydrologically connected.

unless the increased concentration does not cause or contribute to an excursion above an applicable water quality standard, and (5) the timing and location of the discharge would not cause adverse water quality impacts to occur that would not occur if the intake water pollutant were left in-stream. If the above requirements are not met, the permittee may further request that intake water pollutants be considered when effluent limitations are established.

According to the GLI, intake water pollutants may also be considered when establishing effluent limitations if the concentration of the problem pollutant upstream of the discharge exceeds the most stringent applicable water quality criterion/objective, and no TMDL or assessment and remediation plans have been approved. The permitting authority may allow the facility to discharge a mass and concentration of the problem pollutant that are no greater than the mass and concentration of the problem pollutant in the intake water ("no net addition limitations"). Under "no net addition limitations", a discharger may add and remove the problem pollutant, as long as the discharge contains no more mass and/or concentration of the pollutant than the intake water contained. Where proper operation and maintenance of a facility's treatment system results in the removal of a problem pollutant, the permitting authorities may establish limitations that reflect the lower mass and/or concentration of the pollutant achieved by the treatment system.

The GLI also allows the permitting authority to consider multiple sources of intake water when establishing "no net addition limitations". For multiple sources of intake water, a flow-weighted average of each source of the pollutant may be used to derive an effluent limitation, provided that adequate monitoring to determine compliance can be established and is included in the permit. Where a facility's intake water stems from a water supply system, the concentration of the intake pollutant concentration is generally determined at the point where the raw water is removed from the water body. However, if the water supply system removes any of the problem pollutant, the intake pollutant concentration is determined at the point where the water enters the distribution system. If the intake water is ground water in direct hydrological connection with the receiving water, and the pollutant would have naturally reached the vicinity of the outfall in approximately the same time period, credit for intake water pollutants may apply. Intake water credits do not apply if intake water pollutants are from a different body of water than the receiving water.

To address the concern that providing credit for intake water pollutants would discourage development of TMDLs, the GLI placed a 12-year time limit on "no net addition limitations" (these limitations are only effective until March 23, 2007). The goal of TMDLs is to ensure attainment of water quality standards, which would eliminate the need for special permitting provisions for intake water pollutants. Permitting authorities may, however, consider intake water pollutants when establishing waste load allocations to meet TMDLs.

The rescinded ISWP and EBEP did not directly address intake water pollutants, but in effect allowed permit writers to consider intake water credit for power plant discharges by allowing dilution (based on the ratio of the cooling water flow to the combined in-plant waste stream) (see Chapter 1.2.2), and assuming that ambient background concentrations (see Chapter 1.2.3) for pollutants were zero (even when they are not) when effluent limitations were calculated (see Chapter 1.2). The point of compliance was also changed from the end-of-pipe to the point where the combined in-plant waste streams are discharged into the cooling water. For power plant discharges, effluent limitations were established for the combined in-plant waste streams, not for the total discharge (i.e., the combined in-plant waste stream and the cooling water flow). The following steady-state equation was used for calculating effluent limitations for the combined in-plant waste:

$Ce = Co\ (Dc + 1)$ $\rightleftharpoons$ *which can be rearranged as*
$Ce = Co + Co * Dc$

where Ce = the limitation for the combined in-plant waste stream;
Co = the objective; and
Dc = the ratio of the cooling water flow to the combined in-plant waste stream.

Although simple to implement, the above approach has several disadvantages. First, it is limited to power plant discharges, which may be unfair to other dischargers. Secondly, the above equation allows a power plant to add a significant amount of a pollutant to the discharge, even if the concentration of that pollutant is already higher than the criterion or objective in the intake water and the receiving water. The greater the cooling water flow, the greater the amount of the pollutant that could be discharged. Power plants could be allowed to discharge pollutant concentrations that are more than twice the criteria or objectives. Thirdly, the equation can apply to all pollutants in a power plant discharge, not just those that exceed the criterion or objective in the intake water or receiving water. Because the above equation allows dilution, but does not ensure that criteria or objectives are met in the receiving water, effluent limitations may be set too leniently for all pollutants, possibly leading to excursions above the criteria or objectives. The rescinded ISWP and EBEP stated that RWQCBs should impose more restrictive limitations on power plant discharges where necessary for the protection of beneficial uses. However, because the above equation does not consider concentrations or flows of the receiving water, it could be unclear to the permit writer whether beneficial uses were protected.

The Ocean Plan also allows special permitting provisions for power plant discharges. The following equation is used to calculate effluent limitations:

$Ce = Co + Dm\ (Co - Cs)$ $\rightleftharpoons$ *which can be rearranged as*
$Ce = Co + Co * Dm - Cs * Dm$

where Dm = the minimal probable initial dilution expressed as parts seawater per part waste water; and
Cs = the background seawater concentration as listed in the Ocean Plan.
Ce and Co have been defined earlier.

Effluent limitations are calculated for all listed pollutants. The effluent limitations are then converted to mass limitations (either daily maximum or six-month median mass limitations) by multiplying by a conversion factor and the effluent flow. These mass limitations apply to the combined in-plant waste streams with certain exceptions. The excepted pollutants and parameters include total chlorine residual, chronic toxicity, and pollutants for which instantaneous maximum effluent limitations have been calculated to protect aquatic life. The instantaneous maximum effluent limitations for the excepted pollutants and parameters are applied to the final effluent after mixing with the ocean water. Limitations on radioactivity apply to the undiluted effluent.

Compared to the rescinded ISWP and the EBEP, the Ocean Plan is more restrictive and protective of beneficial uses. The Ocean Plan requires all effluent limitations to be calculated so that water quality objectives are met at the edge of the mixing zone. Compliance with instantaneous maximum criteria/objectives and chronic toxicity are assessed at the edge of the mixing zone, which in most cases should protect aquatic life against acute and chronic adverse impacts due to pollutant concentrations in the water column. However, for most pollutants, compliance with daily maximum and six-month median mass limitations are determined for the combined in-plant waste stream only, not for the total discharge. Moving the point of compliance allows the power plant to discharge more mass of the pollutants. If the intake water is salt water and background concentrations are low, the additional mass that could be discharged would probably be insignificant. If the intake water was fresh water with high background concentrations of the pollutant, the additional amount of mass allowed to be discharged could be large.

The Permitting and Compliance Issues Task Force also addressed pollutants in the intake water. The task force recommended that methods be included for making a reasonable potential determination when the water quality criterion/objective is exceeded upstream from the discharge and that policies be developed that address intake water pollutants. A method for addressing intake water pollutants when determining reasonable potential has been described in Chapter 1.1. The task force also recommended that "in certain situations, dischargers that discharge water back into the same water body from which it was taken, shall be responsible for only the increment of constituents that they add to the water, in cases where the intake water is of same quality as the receiving water". The task force recommended that the equation used in the rescinded ISWP and EBEP for power plant discharges be extended to other once-through cooling water discharges as well. The task force also stated that, in general, a TMDL (see Chapter 5.5) should be developed where intake water is of concern.

The five alternatives and twelve options described below have been developed partly based on the GLI, the rescinded plans, and the task force recommendations. The alternatives consider if credit should be extended to pollutants in the intake water when establishing effluent limitations and how much credit to possibly extend. The options address the circumstances under which intake water credit could be allowed, and are intended to be combined with Alternatives 4 or 5, which allow intake water pollutants to be considered when establishing effluent limitations. The alternatives focus on the quality of the receiving water rather than on the quality of the intake water because the purpose of water quality-based effluent limitations is to ensure that beneficial uses of the receiving water body are protected. The U.S. EPA stated in the GLI that "special consideration for intake water pollutants is reasonable when other sources are the primary cause of the impaired water body to which the point source is discharging and the discharge in itself effectively has no further adverse impact on the receiving water than that which already existed". The U.S. EPA further found that applying the procedures for considering intake water pollutants to attainment waters would result in more stringent effluent limitations than when following regular procedures described in U.S. EPA guidance documents (U.S. EPA 1991).

Special provisions for an intake water pollutant do not apply if an approved TMDL for that pollutant exists. Waste load allocations and effluent limitations based on a TMDL are designed to achieve attainment with water quality criteria or objectives in the receiving water body by accounting for all sources of the pollutant, and therefore supersedes waste load allocations and effluent limitations established through other procedures.

III. ALTERNATIVES AND OPTIONS FOR SWRCB ACTION

A. Alternatives describing various permitting provisions to apply to pollutants in the intake water:

Alternative 1: No action. Under this alternative, the RWQCBs would retain the flexibility of deciding whether and under what circumstances credit for intake water pollutants could be granted, consistent with applicable law. This alternative would not promote statewide consistency.

Alternative 2: If the receiving water does not meet an applicable criterion or objective for a pollutant and no TMDL has been completed, the discharge may not contain any amount of that pollutant. This alternative does not allow any amount of a pollutant to be discharged if that pollutant in the receiving water does not meet applicable criteria or objectives and no TMDL has been completed. This approach was included in the draft GLI, but not in the final GLI, because the U.S. EPA concluded that it may not be appropriate in many situations. Commenters on the GLI argued that this approach would force all point sources to achieve a zero discharge of pollutants to non-attained waters, without the assurance that water quality criteria or objectives would ultimately be attained in the receiving water (often waters are impaired due mostly to non-point source pollution). This alternative would likely lower the mass of the pollutant in the receiving water, which could improve the overall condition of the water body. However, this alternative may also result in higher concentrations of the pollutant in the receiving water. This situation could occur if the effluent of a point source discharge was more dilute than the receiving water (for example, because of other intake sources or because the discharger was treating the effluent) and the discharger decides to cease discharging completely rather than try to eliminate the pollutant totally from the discharge. Adverse impacts due to higher concentrations in the water column is therefore a possibility under this approach.

Alternative 3. If the receiving water does not meet an applicable criterion or objective for a pollutant and no TMDL has been completed, the discharge may contain that pollutant at levels no greater than the concentration of the criterion or objective. The U.S. EPA believes that this approach is a permissible and reasonable approach to address adverse environmental and health effects due to the pollutant concentration in non-attained waters, because this alternative complies with the goals of the CWA and is likely to cause a general decrease in the pollutant concentration in the receiving water (U.S. EPA 1995). This alternative may result in additional mass being added to the water body. Where additional mass is of concern, for example due to pollutants in the sediments, more stringent effluent limitations would be required. This approach is not a substitute for developing TMDLs or watershed management strategies, because it does not address contributions from nonpoint sources, and is, therefore, not likely to achieve attainment of water quality criteria or objectives in the receiving water. This approach essentially allows no special provisions for intake water pollutants.

Alternative 4. If the receiving water does not meet an applicable criterion or objective for a pollutant and no TMDL has been completed, the discharge may contain that pollutant at levels no greater than the concentration of the receiving water, if no net addition of the pollutant occurs. The amount and concentration of pollutant that is allowed to be discharged would depend on various factors, such as site-specific conditions and the options presented below. The U.S. EPA allows this approach to be considered for intake water pollutants on a pollutant-by-pollutant and discharge-by-discharge basis, if it can be demonstrated that the discharge has no greater effect on the receiving water than if the discharger had not diverted and returned the intake water pollutants to the same body of water. This approach, with the restrictions discussed earlier, was adopted for the GLI (U.S. EPA 1995). This alternative maintains status quo, as the mass and the concentration of the pollutant in the receiving water is neither likely to increase nor decrease.

Alternative 5. If the receiving water does not meet an applicable criterion or objective for a pollutant and no TMDL has been completed, the discharge may contain a pollutant concentration somewhat above that of the receiving water. The amount and concentration of pollutant that may be discharged would depend on various factors, such as site-specific conditions and the options presented below. The rescinded ISWP and EBEP allowed this approach to be considered for power plant discharges. The U.S. EPA considered and rejected this option when developing the GLI because this approach would cause the water quality of a non-attainment water to get worse both in mass loading and concentration, which conflicts with the goals of the CWA.

B. Options describing various circumstances under which intake water credit could be allowed (these options may be combined with Alternatives 4 and 5):

Option A: Allow intake water credit on a pollutant-by-pollutant and discharge-by-discharge basis only. The U.S. EPA stipulated in the GLI that intake water credit would only be considered on a pollutant-by-pollutant and discharge-by-discharge basis, but initially considered allowing a general credit that could apply to an entire water body. The rationale for not allowing a general intake water credit was that this approach could cause further degradation of an already impaired water body and would, therefore, not be in compliance with the CWA. Determining if an intake water credit will cause an adverse impact on water quality can only be done on a pollutant-by-pollutant and outfall-by outfall basis because of site-specific factors such as the location of the intake and discharge points, receiving water characteristics, time interval between intake and discharge, possible alterations of the pollutant, possible pollutant additions, or treatment. The rescinded ISWP and EBEP did not specify that intake water credit be established on a pollutant-by-pollutant and discharge-by-discharge basis, but stated that RWQCBs should establish more restrictive limitations where necessary to protect beneficial uses; this could be interpreted to require that intake water credits, if allowed, be established on a pollutant-by-pollutant and discharge-by-discharge basis.

Option B: Allow intake water credit only where the pollutant concentration in the intake water is greater than the criterion or objective. If the intake water concentration is less than the criterion or objective, the need for an intake water credit is nonexistent because the facility should be able to meet the criterion or objective at the end-of-pipe or at the edge of a mixing zone with a regular effluent limitation, unless additional pollutant has been added to the effluent. The GLI requires that for intake water credit to apply, the concentration of pollutant in the intake must be similar to the concentration in the receiving water, which must be above the criterion or objective. In other words, the intake water must be above the criterion/objective as well. However, the rescinded ISWP and EBEP allowed intake water credits for power plant discharges in situations where the pollutant concentration in the intake water and the receiving water was less than the criterion or objective.

Option C: Allow intake water credit only where the intake water is from the same water body as the receiving water body. This condition is satisfied by a demonstration that: (1) the ambient background concentration (see Chapter 1.2.3) of the intake water pollutant in the receiving water is similar to that in the intake water; (2) there is a direct hydrological connection between the intake and discharge points; and (3) water quality characteristics are similar in the intake water and the receiving water. The rescinded ISWP and EBEP did not specify that the intake water be from the same water body as the receiving water, only that the beneficial uses of the receiving water body be protected. However, the GLI initiative requires that the intake water be from the same water body as the receiving water, because the U.S. EPA "believes that direct adjustment of limits to account for pollutants in the intake water should be restricted to those pollutants that would be in the receiving water with the same effect even if the discharger had not withdrawn and subsequently discharged those pollutants. The EPA recognizes that in some instances discharges from other bodies of water that exceed applicable water quality criteria/objectives for the receiving water but have a lower concentration than the receiving water could theoretically improve the overall water quality from the standpoint of water column concentrations in the receiving water. .... Although the resulting ambient concentration could be lower, the mass of a pollutant would increase by the transfer of pollutants to a different body of water. ... In particular, the additional mass of a persistent pollutant may offset the environmental benefits of lowering water column concentrations because the additional mass, if cycled through sediments by deposition and resuspension or through the food chain, could negatively impact the water body so as to ultimately prolong the non-attainment status of the water body." (U.S. EPA 1995). In the draft GLI, other options were considered for intake water from different water bodies, such as allowing credit based on the amount of pollutant in all sources of intake water, allowing credit based on the concentration of the pollutant in the receiving water, or allowing credit based on a combination of the amount of pollutant in all sources of intake water and the concentration of the pollutant in the receiving water. However, these options were not adopted.

Option D: <u>Allow intake water credit only where the pollutant is chemically or physically unaltered by the facility, unless it can be demonstrated that water quality and beneficial uses are not adversely affected</u>. The basic premise in the GLI for allowing intake water credit is that a discharge has no greater impact on the receiving water than if the discharger had not removed and returned the intake water pollutants to the same body of water. This option is one method for determining whether the discharge of intake water pollutants would adversely impact the receiving water body.

Option E: <u>Allow intake water credit only where the intake water pollutant reaches the vicinity of the outfall within the same time period and with the same effect as it would if not removed by the facility, unless it can be demonstrated that water quality and beneficial uses are not adversely affected</u>. This option, like Option 4, is a method for determining whether the discharge of intake water pollutants would adversely impact the receiving water body.

Option F: <u>Allow intake water credit only where the intake water pollutant is neither added, nor removed by the facility</u>. This approach is consistent with the basic premise in the GLI that a discharge must have no greater impact on the receiving water than if the discharger had not removed and returned the intake water pollutants to the same body of water. This option may be unnecessarily strict, however. For example, many facilities remove some amount of the pollutants in their intake water when they treat their effluent for other pollutants, yet may not be able to remove an amount sufficient to meet criteria or objectives at the end-of-pipe. While partial removal of intake water would improve receiving water conditions, it would not be allowed under this option.

The GLI approach may be better: "Where proper operation and maintenance of a facility's treatment system results in removal of a pollutant, the permitting authority may establish limitations that reflect the lower mass and/or concentration of the pollutant achieved by such treatment, taking into account the feasibility of establishing such limits". The GLI further allows a facility to contribute additional mass of the intake water pollutant if: (1) an equal or greater amount of the pollutant is removed before discharge to the receiving water; (2) 100 percent of the intake water is from the same water body as the receiving water; and (3) the discharge has no greater impact on the receiving water than if the discharger had not removed and returned the intake water pollutants to the same body of water.

Option G: Allow intake water credit where the intake water is ground water. The rescinded ISWP and EBEP had no restrictions on the origins of the intake water when considering intake water credit for power plant discharges. The GLI specifically allows intake water credit for ground water where the ground water meets the definition of the same body of water as the receiving water, except where the pollutant in the intake is due partially or entirely to human activity. Given these restrictions and the difficulty of demonstrating that these conditions are met, very few dischargers would be eligible for this type of intake water credit. Lesser restrictions may not protect water quality.

Option H: Allow intake water credit where the source of the intake water is a water supply system. The rescinded ISWP and EBEP had no restrictions on the origins of the intake water when considering intake water credit for power plant discharges. The GLI specifically allows intake water credit where the source of the intake water is a water supply system if the intake water for the water supply system is from the same water body as the receiving water for the discharge. The concentration of the intake water pollutant is determined at the point where the raw water is removed, unless the water supply system treats the water and removes some of the pollutant, in which case the concentration of the intake water pollutant is determined where the water enters the distribution system. This approach allows some dischargers that receive their intake water from a water supply system to be considered for intake water credit.

Option I: Allow intake water credit where the discharge contains multiple sources of intake water. The rescinded ISWP and EBEP had no restrictions on the origins of the intake water when considering intake water credit for power plant discharges. The GLI specifically allows consideration of intake water credit where the intake water consists of multiple sources of intake water. The GLI allows the permitting authority to derive effluent limitations by applying a flow-weighted average of each source of pollutant, provided that adequate monitoring to determine compliance can be established and is included in the permit. Intake water credit could be applied to the portion of the discharge that contained intake water pollutants from the same water body as the receiving water body, whereas the remaining portion of the discharge would have to meet the criteria or objectives at the end-of-pipe. This approach allows intake water credit to be extended to discharges where less than 100 percent of the intake originates from the same water body as the receiving water.

Option J: Allow intake water credit only for certain types of discharges. Intake water credit could be restricted to certain types of discharges such as power plant discharges (as in the rescinded ISWP and EBEP) or once-through cooling water discharges (as partially recommended by the Permitting and Compliance Issues Task Force). This option may be unfair to those dischargers that do not fall into the categories that qualify for the intake water credit, but have similar circumstances. Rather than limiting the types of discharges that are eligible for intake water credit, it may be more fair to limit the circumstances under which intake water credit may be allowed. The GLI did not limit intake water credit based on discharger type.

Option K: Allow intake water credit based on pollutant types or characteristics. Intake water credit could be limited based on pollutant type or characteristics, such as ubiquitous pollutants, pollutants that do not bioaccumulate, non-metals, non-cancer-causing substances, etc. The rescinded ISWP and EBEP did not limit intake water credit based on the type or characteristic of a pollutant, but the Ocean Plan does. The U.S. EPA solicited comment on this issue when drafting the GLI. Some commented that categorizing pollutants may be difficult; others stated that any treatment needed for pollutants not eligible for intake water credit would likely remove the eligible pollutants as well. The U.S. EPA decided to not restrict intake water credit based upon pollutant type or characteristics, but leave the issue to the discretion of states and tribes.

Option L: Authorize intake water credit for a limited time only. The purpose of a time limit on authorizing intake water credit is to not discourage the development of TMDLs or watershed management strategies by providing indefinite permitting relief in non-attained waters. The GLI allowed intake water credits to be authorized for a period of up to twelve years, after which point-source dischargers must either meet criteria or objectives at the end-of-pipe or meet assigned waste load allocations.

IV. STAFF RECOMMENDATION

Adopt Alternative 4 with Options A, B, C, D, E, H, I, and L.